# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-036964

(43)Date of publication of application : 09.02.2001

(51)Int.Cl. H04Q 7/38
H04B 7/26
H04J 13/00
H04L 1/00

(21)Application number : 11-205772

(22)Date of filing : 21.07.1999

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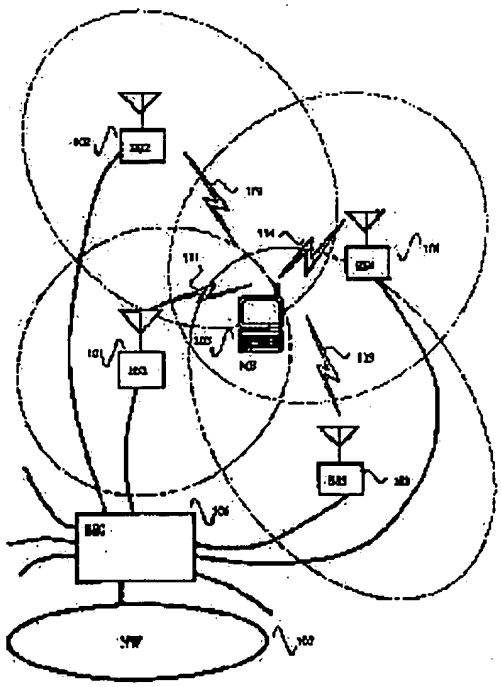
## (54) COMMUNICATION SYSTEM AND ITS METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To attain high speed transmission and the valid use of a radio resource in a radio communication system.

SOLUTION: In this communication system constituted of a radio terminal 105 and plural radio base stations 101-104 for communicating through a communication line with the radio terminal, a communication line to be used for communication is selected based on the communication line qualities 111-114, and communication information is divided for each selected communication line, and the divided communication information is communicated through the selected communication line so that high speed transmission can be realized.



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[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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[Claim(s)]
[Claim 1] Communication system which selects two or more communication lines which should be used for a communication link, and is characterized by the thing from which it was selected, and which communication link information is divided for said two or more communication lines of every, and is communicated through said selected communication line in said divided communication link information based on the circuit quality of said communication line in the communication system which consists of two or more base transceiver stations which communicate through a wireless terminal, said wireless terminal, and a communication line.
[Claim 2] Communication system according to claim 1 characterized by dividing after error-correcting-code-izing said communication link information and interleave-izing it further, in case communication link information is divided for said two or more of said selected communication lines of every.
[Claim 3] In the correspondence procedure of the communication system containing two or more base stations which communicate with a wireless terminal and said wireless terminal, and the base station control station which controls said base station Each communication link quality of two or more transmission lines between said wireless terminal and said two or more base stations is computed. Based on said each computed communication link quality, the transmission speed which can transmit said wireless terminal is computed for said every base station. Based on said each computed transmission speed, information is distributed for every aforementioned base station. Said distributed information is transmitted with the transmission speed defined for every aforementioned base station to said base station corresponding to each. In each aforementioned base station, receive said distributed information, and each aforementioned base station transmits said received information to said base station control station. Said base station control station is a correspondence procedure characterized by receiving the information which each aforementioned base station transmitted, and re-compounding the information from said each received base station in said base station control station.
[Claim 4] In the correspondence procedure of the communication system containing two or more base stations which communicate with a wireless terminal and said wireless terminal, and the base station control station which controls said base station Each communication link quality of two or more transmission lines between said wireless terminal and said two or more base stations is computed. Based on said each computed communication link quality, said each base station computes the transmission speed which can be transmitted to said wireless terminal. Said base station control station The information which should be transmitted to said wireless terminal is distributed for every aforementioned base station based on said each computed transmission speed. Each aforementioned base station It is the correspondence procedure which it transmits with the transmission speed which was able to define said distributed information for every aforementioned base station, and said wireless terminal receives the information which each aforementioned base station transmitted, and is characterized by said wireless terminal re-compounding the information from said each received base station.
[Claim 5] Communication system characterized [ according to claim 3 to 4 ] by distributing after error-

correcting-code-izing said information and interleave-izing it further, before distributing said information.
[Claim 6] In the base station control station which controls two or more base stations which communicate with a wireless terminal The storage which memorizes the communication link quality of the transmission line of said wireless terminal and each aforementioned base station, The transmission-speed calculation equipment which computes the transmission speed which should be adapted for every base station based on the communication link quality for every transmission line memorized by said storage, The base station control station characterized by having the division equipment which divides communication link information for every base station based on the transmission speed for every base station computed by said transmission-speed calculation equipment, and the sending set which transmits the communication link information divided by said division equipment to said each base station.
[Claim 7] Said communication link quality is a base station control station according to claim 6 characterized by said wireless terminal collecting for every channel.
[Claim 8] The receiving set which receives the signal from said two or more base stations in the wireless terminal which communicates with two or more base stations, The communication link quality calculation equipment which computes each communication link quality of two or more signals received with said receiving set, The rate calculation equipment which computes the transmission speed which can be transmitted for said every base station based on each communication link quality computed by said communication link quality calculation equipment and which can be transmitted, The wireless terminal characterized by having the division equipment which divides the information which should be transmitted for every aforementioned base station based on each transmission speed computed by said rate calculation equipment which can be transmitted, and the sending set which transmits the information divided by said division equipment to each aforementioned base station.
[Claim 9] The receiving set which receives the signal from said base station in the wireless terminal which communicates with two or more base stations, The signal pair interference wave power ratio calculation equipment which computes the signal pair interference wave power ratio of the signal received with said receiving set, The transmission-speed calculation equipment which computes the transmission speed to said base station based on said signal pair interference wave power ratio, The table listing device which creates the table to which make the transmission speed computed by said transmission-speed calculation equipment come to correspond for said every base station, The storage which memorizes the table created by said table listing device, The wireless terminal characterized by having the division equipment which divides communication link information for said two or more base stations of every based on the table memorized by said store, and the sending set which transmits the communication link information divided by said division equipment to each base station.
[Claim 10] The receiving set which receives the information-sharing instruction signal transmitted from any one of said base stations in the wireless terminal which communicates with two or more base stations, The wireless terminal characterized by having the division equipment which divides the information which should be transmitted for every aforementioned base station based on the information-sharing instruction signal received by said receiving set, and the sending set which transmits the information divided by said division equipment with the transmission speed which was able to be defined for every aforementioned base station.
[Claim 11] It is the wireless terminal according to claim 10 characterized by for the transmission speed for every base station and the rate of division to be contained in said information-sharing instruction signal, as for said division equipment, to divide information into it for every base station based on the rate of said information-sharing instruction signal ********** aforementioned division, and for said sending set to transmit to it the information divided by said division equipment based on said transmission speed contained in said information-sharing instruction signal for every aforementioned base station.
[Claim 12] In the base station control station which controls two or more base stations which communicate with a wireless terminal The transmission-speed calculation equipment which computes the receiving transmission speed which should be adapted for this every base station based on the

receiving quality for said every base station, The sending set which transmits the receiving transmission speed for said every base station which said transmission-speed calculation equipment computed to said wireless terminal via at least one base station, The receiving set which receives the communication link information which said wireless terminal divided and transmitted for said every base station based on said receiving transmission speed which said sending set transmitted through this each base station, The base station control station characterized by having the multiplexer which was received with said receiving set, and which multiplexes division **** communication link information for every base station.

[Claim 13] In the base station controller which controls two or more base stations which communicate with a wireless terminal The transmission-speed calculation equipment which computes the transmission speed which can be transmitted by said going-up circuit based on the signal pair interference wave power ratio of the going-up circuit of each base station which said each base station computed, it is said transmission-speed calculation equipment -- with the table listing device which creates the table to which said computed transmission speed is made to correspond for said every base station The storage which memorizes the table created by said table listing device, The base station control station characterized by having the multiplexer which said wireless terminal multiplexes two or more communication link information which divided into said two or more base stations so much, and was transmitted to them based on the table memorized by said store, and is restored to the information before division.

[Claim 14] In the wireless terminal which communicates with two or more base stations controlled by the base station control station The communication link quality calculation equipment which said two or more base stations get down, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, Said rate calculation equipment which said communication link quality calculation equipment computed, which gets down and computes the transmission speed which can be transmitted by each going-down circuit of each of said base station based on each communication link quality for every signal and which can be transmitted, The sending set which transmits the transmission speed of each of said base station which said rate calculation equipment which can be transmitted computed to said base station control station via at least one base station, The wireless terminal characterized by having the multiplexer which multiplexes the communication link information which said base station control station divides and transmits for said two or more base stations of every based on said transmission speed based on this transmission speed, and is restored to the information before division.

[Claim 15] In the wireless terminal which communicates with two or more base stations controlled by the base station control station The communication link quality calculation equipment which said two or more base stations get down, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, The sending set which transmits said communication link quality to said base station control station through said one of base stations, The receiving set which receives the communication link information which said base station control station got down based on said communication link quality, the transmission speed for every circuit was computed, and said plurality got down based on said computed transmission speed, divided for every circuit, and was transmitted, The wireless terminal characterized by having the multiplexer which multiplexes said communication link information which said receiving set received based on said transmission speed.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the radio approach and a radio communication equipment, and relates to the radio approach especially set up and employed between a terminal, a base station, and a base station controller in radio communications systems, such as a cellular communication system.
[0002]
[Description of the Prior Art] Although communicating with one base station is most, in the case of hand-over, a terminal connects the conventional terminal with two or more base stations exceptionally. For example, as an example of the conventional technique, there are USP 5, 101, and 501, USP 5, 267, and 261, USP 5, 088, and 108, USP 5, 109, and 528, USP 5, 327, and 577, and invention indicated by the ****** No. 511835 [ ten to ] official report.
[0003] The service area of a base station is made to overlap a radio communications system between adjoining base stations generally that the continuity of communication service should be guaranteed. A handover is performed in this overlapped field. Although a terminal performs two or more base stations and line connections in the case of a handover, the data of the same contents are transmitted and received for any circuit.
[0004]
[Problem(s) to be Solved by the Invention] Which cellular wireless terminal may be in the electric-wave condition which can communicate with other base stations with a certain fixed transmission speed the base station of 1, and during a communication link. Such an electric-wave environment mainly has few other users, and when an empty circuit exists, they are generated. [ many ] since the number of users connectable with a base station is determined as coincidence in CDMA (code division multiple access standard) by the interference power ratio with other terminals, if other terminals are in few situations -- since interference power is small -- other base stations -- coincidence -- **** -- it becomes the electric-wave environment [-izing / an environment ]. However, in the conventional system, even if it suits such an electric-wave environment, since it connects only with one base station, a terminal has the technical problem that it will be restricted to the maximum of the circuit whose transmission speed is one. On the other hand, although a terminal may be connected to two or more base transceiver stations and coincidence for a handover, each circuit connectable with this coincidence can send only the same information on the property of a handover. Therefore, since it is the structure which can transmit and receive only the same information as the circuit under current connection in other wireless circuits even if it suits the electric-wave condition in which connection with other base stations is possible using other wireless circuits, the result which cannot use a wireless resource effectively is caused. After all, in transmission, the technical problem that transmission speed will be restricted at the maximum per circuit occurs.
[0005] When it is in an electric-wave environment connectable also with the base station of 1, and the base transceiver station of others [ terminal / under connection ] in view of the above-mentioned

technical problem, the purpose of this invention is connecting with other base transceiver stations at coincidence, and aims at raising transmission speed by distributing and sending the information which should be transmitted and received by the terminal and network side.
[0006] Moreover, in case it communicates to two or more base transceiver stations and coincidence, line speed is determined according to the electric-wave environment, and it aims at effective use of a wireless resource, and offering the communication service stabilized more in each base transceiver station.
[0007] Furthermore, when an electric-wave environment gets worse two or more base transceiver stations and during a communication link, it aims at offering the dynamic communication service according to an electric-wave environment by carrying out adjustable [ of the transmission speed ] according to it, or occasionally cutting a circuit.
[0008] Furthermore, it aims at distributing and transmitting to a circuit with two or more base stations, after it error-correcting-code-izes information to transmit and it carries out an interleave, multiplexing by carrying out a day interleave, after multiplexing the circuit written in a receiving side, and carrying out error correction decode, even if the communication link quality of some circuits deteriorates, and suppressing degradation of the signal after an error correction low.
[0009] Furthermore, in this invention, if an electric-wave environment avoids, a high-speed circuit will be assigned, but if an electric-wave environment gets worse, it will aim at offering wireless service best-effort by making the transmission speed into a low speed.
[0010]
[Means for Solving the Problem] The receiving set which receives the signal from two or more base stations that the wireless terminal of the invention in this application should solve an above-mentioned technical problem, The communication link quality calculation equipment which computes each communication link quality of two or more signals received with said receiving set, The rate calculation equipment which computes the transmission speed which can be transmitted for said every base station based on each communication link quality computed by said communication link quality calculation equipment and which can be transmitted, It has the division equipment which divides the information which should be transmitted for every aforementioned base station based on each transmission speed computed by said rate calculation equipment which can be transmitted, and the sending set which transmits the information divided by said division equipment to each aforementioned base station.
[0011] Moreover, in the invention in this application, a signal pair interference wave power ratio (for example, Eb/N0, Ec/I0, or these should put together) is used as communication link quality.
[0012] Moreover, the receiving set with which the wireless terminal of the invention in this application receives the signal from said base station, The Eb/N0 calculation equipment which computes signal pair interference wave power ratio Eb/N0 of the signal received with said receiving set, The signal pair interference wave power ratio calculation equipment which computes ** received with said receiving set, based on said signal pair interference wave power ratio with the transmission-speed calculation equipment which computes the transmission speed (or -- from said base station) to said base station The table listing device which creates the table to which make the transmission speed computed by said transmission-speed calculation equipment come to correspond for said every base station, It has the store which memorizes the table created by said table listing device, the division equipment which divides communication link information for said two or more base stations of every based on the table memorized by said store, and the sending set which transmits the communication link information divided by said division equipment to each base station.
[0013] Moreover, the storage with which the base station control station of the invention in this application memorizes the communication link quality of the transmission line of said wireless terminal and each aforementioned base station, The transmission-speed calculation equipment which computes the transmission speed which should be adapted for every base station based on the communication link quality for every base station memorized by said storage, It has the division equipment which divides communication link information for every base station based on the transmission speed for every base station computed by said transmission-speed calculation equipment, and the sending set which transmits

the communication link information divided by said division equipment to said each base station. in addition, the wireless terminal or the base transceiver station collected communication link quality for every channel -- it comes out.
[0014] Moreover, the wireless terminal of the invention in this application is equipped with the receiving set which receives the information-sharing instruction signal transmitted from any one of base stations, the division equipment which divides the information which should be transmitted for every aforementioned base station based on the information-sharing instruction signal received by said receiving set, and the sending set which transmit the information divided by said division equipment with the transmission speed which was able to be defined for every aforementioned base station. In addition, the transmission speed for every base station and the rate of division are contained in an information-sharing instruction signal, as for said division equipment, information is divided into it for every base station based on the rate of said information-sharing instruction signal ********** aforementioned division, and said sending set transmits to it the information divided by said division equipment based on said transmission speed contained in said information-sharing instruction signal for every aforementioned base station.
[0015] In addition, a transmission-speed control signal may be used instead of an information-sharing instruction signal, and you may constitute so that information may be divided for every base station based on the transmission speed contained in this transmission-speed control signal.
[0016] Two or more base stations where the correspondence procedure of the invention in this application communicates with a wireless terminal and said wireless terminal, It is the correspondence procedure of the communication system containing the base station control station which controls said base station. Each communication link quality of two or more transmission lines between said wireless terminal and said two or more base stations is computed. Based on said each computed communication link quality, the transmission speed which can transmit said wireless terminal is computed for said every base station. Based on said each computed transmission speed, information is distributed for every aforementioned base station. Said distributed information is transmitted with the transmission speed defined for every aforementioned base station to said base station corresponding to each. Said distributed information is received in each aforementioned base station, each aforementioned base station transmits said received information to said base station control station, and said base station control station receives the information which each aforementioned base station transmitted, and re-compounds the information from said each received base station in said base station control station.
[0017] Moreover, the correspondence procedure of the invention in this application computes each communication link quality of two or more transmission lines between a wireless terminal and two or more base stations. Based on said each computed communication link quality, said each base station computes the transmission speed which can be transmitted to said wireless terminal. Said base station control station The information which should be transmitted to said wireless terminal is distributed for every aforementioned base station based on said each computed transmission speed. Each aforementioned base station It transmits with the transmission speed which was able to define said distributed information for every aforementioned base station, said wireless terminal receives the information which each aforementioned base station transmitted, and said wireless terminal re-compounds the information from said each received base station.
[0018] In addition, although a wireless terminal or a base station computes the communication link quality of a transmission line, when a wireless terminal computes, it may report communication link quality to a base station control station through a base station. A base station control station computes transmission speed based on such communication link quality. In addition, you may compute in a wireless terminal or a base station.
[0019] Moreover, the communication system of the invention in this application consists of two or more base transceiver stations which communicate through a wireless terminal, said wireless terminal, and a communication line, based on the circuit quality of a communication line, selects the communication line which should be used for a communication link, and makes high-speed transmission possible by communicating through the communication line which had the selected communication link information

which divided communication link information for every communication line, and was divided selected.

[0020] Moreover, the communication system of the invention in this application makes possible ** which makes signal degradation after multiplexing the minimum, even if a part of communication line quality deteriorates, in order to perform an error correcting code and an interleave by the transmitting side before division of communication link information and to perform day interleave decode after multiplex by the receiving side.
[0021] Moreover, the transmission-speed calculation equipment which computes the receiving transmission speed for which the base station control station of the invention in this application should be adapted for this every base station based on the receiving quality for every base station, The sending set which transmits the receiving transmission speed for said every base station which said transmission-speed calculation equipment computed to said wireless terminal via at least one base station, Said wireless terminal is equipped with the receiving set which receives the communication link information divided and transmitted for said every base station through this each base station, and the multiplexer which was received with said receiving set and which multiplexes division **** communication link information for every base station based on said receiving transmission speed which said sending set transmitted.
[0022] Moreover, the transmission-speed calculation equipment which computes the transmission speed which can be transmitted by said going-up circuit based on the signal pair interference wave power ratio of the going-up circuit of each base station where said each base station computed the base station control station of the invention in this application, it is said transmission-speed calculation equipment -- with the table listing device which creates the table to which said computed transmission speed is made to correspond for said every base station It has the multiplexer which multiplexes the storage which memorizes the table created by said table listing device, and two or more communication link information which said wireless terminal divided into said two or more base stations so much, and transmitted to them based on the table memorized by said storage, and is restored to the information before division.
[0023] Moreover, the communication link quality calculation equipment which said two or more base stations get down from the wireless terminal of the invention in this application, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, Said rate calculation equipment which said communication link quality calculation equipment computed, which gets down and computes the transmission speed which can be transmitted by each going-down circuit of each of said base station based on each communication link quality for every signal and which can be transmitted, The sending set which transmits the transmission speed of each of said base station which said rate calculation equipment which can be transmitted computed to said base station control station via at least one base station, It has the multiplexer which multiplexes the communication link information which said base station control station divides and transmits for said two or more base stations of every based on said transmission speed based on this transmission speed, and is restored to the information before division.
[0024] Moreover, the communication link quality calculation equipment which two or more base stations get down from the wireless terminal of the invention in this application, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, The sending set which transmits said communication link quality to said base station control station through said one of base stations, The receiving set which receives the communication link information which said base station control station got down based on said communication link quality, the transmission speed for every circuit was computed, and said plurality got down based on said computed transmission speed, divided for every circuit, and was transmitted, It has the multiplexer which multiplexes said communication link information which said receiving set received based on said transmission speed.
[0025] Moreover, in the invention in this application, the following correspondence procedures are adopted that an above-mentioned technical problem should be solved.
[0026] (1) In terminal dispatch, in an access channel and base station dispatch, set up one wireless

circuit between a terminal and one base station by the paging channel. This is the same as the conventional wireless cross connection approach depended cellular.
[0027] (2) Assume the case where there is a high-speed transmission demand further and the transmission or receiving capacity is in a terminal using another channel rather than the transmission speed specified in either the terminal, the base station and the base station controller. The circuit which set up the control signal power of 1 or two or more base stations including the base station under received connection by the above-mentioned (1) reports a terminal to a base station and a base station controller. For example, in the case of CDMA, pilot signal power is reported.
[0028] (3) A base station controller chooses the transmission speed in which the wireless resource for every base station and transmission and reception of a terminal are possible to a connection candidate's base station from the report result of (2). Furthermore, it judges whether a circuit is newly connectable to each candidate base station, and the transmission speed assigned from the interference noise power report for every candidate base station of a wireless terminal is determined as it.
[0029] (4) A base station controller reports to a terminal the transmission speed which can be assigned to the connectable list of other base stations, and each base station using the circuit set up by (1).
[0030] (5) A terminal sets up a circuit with new 1 or two or more new base stations according to directions of (4). This procedure is the same as the time of hand-over, if it removes that the number of base stations which it is newly going to connect may exceed 2.
[0031] (6) A base station controller notifies it to a terminal while checking completion of the cross connection in (5). It gets down, and by the circuit (it transmits to a terminal from a base station), a sending signal is compared to transmission speed and it distributes for every circuit, and for every base station, a base station controller regards it as the independent signal sequence, and becomes irregular, and it transmits to a terminal. After a terminal restores respectively independently to the signal received from 1 or two or more base stations for every circuit, it multiplexes them in order of a signal sequence, and reproduces the transmitted signal.
[0032] (7) In the case of an uphill circuit (it transmits to a base station from a terminal), a base station controller chooses a connection candidate base station from the result of (2). Furthermore, it judges whether a circuit is newly connectable with each candidate base station, and it gets down, the transmission speed of an uphill circuit is presumed and determined from the receiving level of a circuit, and it reports to a wireless terminal. At this time, a base station controller may report only the base station linked to a wireless terminal, and a wireless terminal may determine transmission speed. If a line connection procedure is completed between a wireless terminal and a base station controller, a terminal compares a sending signal to the transmission speed which can be transmitted between base stations, and distributes for every circuit, and to 1 or two or more base stations, it will become irregular respectively independently and will transmit. After a base station controller restores respectively independently to the signal received from 1 or two or more base stations for every circuit, it multiplexes them in order of a signal sequence, and reproduces the transmitted signal.
[0033] (8) Moreover, in the transmitting side of a base station controller and a terminal, in order to strengthen error proof stress, before distributing a signal for every circuit, error-correcting-code-izing and an interleave may be performed. In that case, in the receiving side of a base station controller, the rearrangement of the signal to which it restored in each base station is carried out with a base station controller, a day interleave is carried out to a transmitting side in the order of a foul trick, and an error correction decryption is performed. It is the same, and the receiving side of a terminal also carries out the rearrangement of the signal to which it restored by each receive port, carries out a day interleave to a transmitting side in the order of a foul trick, and performs an error correction decryption. When the quality of a certain circuit deteriorates rapidly by this among the circuits which have more than one, degradation of circuit quality can be minimized.
[0034] (9) After setting up two or more circuits between a terminal, a base station, and a base station controller, transmission and reception of the control information between a terminal and a base station controller may use any circuit.
[0035] (10) According to migration of a terminal, a terminal and the electric-wave condition between

base stations change. Therefore, it is necessary to make a certain circuit into **, and it newly needs to set up a circuit. A communication link is maintained by performing a setup and discharge of a circuit an electric-wave environment and if needed for a user.
[0036] In addition, the transmission speed of the signal (uphill circuit) which a wireless terminal transmits judges whether based on the communication link quality which the base station control station received in each last base station, a wireless resource is usable with reference to a transmission-speed table, and is decided, and a base station control station notifies the determined transmission-speed information to a wireless terminal via at least one base station.
[0037] Moreover, based on communication link quality with each base station received at the wireless terminal just before transmitting, a wireless terminal determines the transmission speed of the signal (getting down circuit) which a base station (base station control station) transmits with reference to a transmission-speed table. The information on transmission speed that each base station can be transmitted is notified to a base station control station via at least one base station from a wireless terminal. However, at a wireless terminal, since not all wireless resources are manageable, a wireless terminal may notify communication link quality with each base station to a base station control station, and a base station control station may determine transmission speed after judging the use propriety of a wireless resource.
[0038]
[Embodiment of the Invention] The maximum transmission speed of a digital communication system is determined by the ratio of digital signal power and interference noise power according to the modulation technique of the system. When the power per bit and the ratio of the interference noise power flux density per band define this, it is expressed with Eb/No in many cases. Moreover, it is also possible to apply by the integral value (Ec) covering PN chip period of pilot power and the total received-power spectrum consistency in a band (Io), and it is expressed in the system using periodic PN codes, such as CDMA, as a sign of a pilot signal by Ec/Io in this case in many cases. In addition, Eb/No and the scale which expresses other circuit quality instead of Ec/Io may be used. In this paper, it explains focusing on the example applied to CDMA, and these description is used below.
[0039] (Example 1) The configuration of the cellular system which applies this invention to drawing 1 is shown. A terminal (Mobile Station: henceforth, MS) 105 is connected with base stations 101-104 (Base Station: henceforth, BS) through a wireless circuit. Moreover, each BS connects with a base station controller 106 (Base Station Controller: henceforth, BSC) by the communication line. In addition, BSC connects with the network 107 of a high order. In addition, the circuit which each circuits 111-114 became independent of, respectively is characteristic at this invention, and it is the point that the information to which line speed is also transmitted also differs. That is, by distributing, transmitting and receiving the information usually transmitted and received through one BS to two or more BS, high-speed transmission is made possible as a whole.
[0040] The drawing which made drawing 1 more detailed is indicated in drawing 2 . In drawing 2 , since Ec/I0 of a circuit 111 is the highest, transmission speed is assigned most highly. Hereafter, according to Ec/IO, transmission speed is assigned also for circuits 112-114. In addition, the communication link of the wireless terminal 105 with the transmission speed of K+L+M+N is attained at the maximum under the interference control condition between circuits.
[0041] The configuration of BSC of this invention is explained using drawing 2 . A forward link consists of the buffer / the separation section 207 which performs control for separating the coding + interleave section 208 which encodes and carries out the interleave of the data from a network 107, and its output according to the transmission speed set up for every BS, and data distribution apparatus 206 which performs an interface function and data transmission with each BS. Moreover, a reverse link buffers the data concentrator 201 which collects the traffic and the control data from each BS, and its output, and consists of the day interleave + decode section 203 which decrypts by carrying out the day interleave of the buffer / multiplexing section which carries out multiplex restoration, and its output to the data of a basis. In addition, each configuration section of the above-mentioned forward link and a reverse link manages the usable wireless resource of each BS of the transmission-speed control section

204 and a BSC subordinate which assigns transmission speed, and includes the wireless resource Management Department 205 which distributes.
[0042] On the other hand, MS obtains the circuit of BS with best Eb/No, when Ec/Io of a pilot signal connects with best BS. However, if it exceeds the lower limit from which Eb/No required to maintain the transmission speed which needs Ec/Io for systems operation and circuit quality of the pilot signal which other BS transmits is obtained, the circuit can also communicate by choosing transmission speed appropriately and making it correspond. Here, Eb/No of a signal which received from BS 101-104 was set to k, l, m, and n (k>l>m>n) at order, and corresponding transmission speed (bit per second: henceforth, bps) was set to K, L, M, and N (K>L>M>N). The wireless resource Management Department 205 manages the circuit quality k, l, m, and n of the circuit 111-114 detected by MS105 or BS 101-104. The transmission-speed control section 204 computes the possible transmission speed for every circuit for the circuit quality of each circuit stored in the wireless resource Management Department 205 based on read-out and this circuit quality. The transmission-speed control section 204 stores the transmission speed for every computed circuit as a table. In addition, although only four BS is indicated by drawing 1 and 2, you may be 4 or more and 4 or less.
[0043] Next, the going-down circuit which BS transmits is explained to an example. The information from NW107 will serve as the frame structure 302 with which the tail bit (Tail) was added, if a frame identifier (ID), a frame attribute (Type), and continuing error correcting code-ization assume that it is convolutional code-ization for every specified information [ which is shown by 301 of drawing 3 ] length. It encodes in the coding section (FEC+Interleave) 208, and this frame 302 serves as the encoded sequence (FEC+Interleaved Sequence) 303. The coding parameter at this time is specified by the transmission-speed control section 204 and the wireless resource Management Department 205. A buffer / separation section 207 once stores the encoded information sequence. Based on the table of the transmission-speed control section 204, subframe division of the data distribution section 206 is carried out for every BS in the information sequence stored in the buffer 207 by the suitable information length shown by 304 of drawing 3 . For example, subframe length is determined as the circuit 111 of BS101 at a rate of K/(K+L+M+N), and is determined as the circuit 112 of BS102 at a rate of L/(K+L+M+N). The frame identifier (ID) and frame attribute (Type) which made the regulation in the case of BS and demultiplexing which are transmitted are added, and a subframe serves as the frame structure 305 of drawing 3 . A subframe is transmitted to BS 101-104 by the distribution section (Data Distribution) 206. At this time, circuit quality information, control information, etc. of a reverse link may be added to a frame 302 and a subframe 305. The data distribution section 206 transmits a subframe to each BS. Each BS which received the subframe is put on a radio frequency, and transmits a subframe to MS105.
[0044] In addition, the transmission-speed control section 204 may manage directly circuit quality information, such as Ec/Io of each forward link collected by the reverse link by MS105, Eb/No, and a frame error rate (henceforth, FER), instead of the wireless resource Management Department 205. In that case, the transmission-speed control section 204 determines the forward link transmission speed for every circuit based on the circuit quality stored in the table, and stores the transmission speed for every circuit in a table similarly while it stores the quality of each circuit in a table. The wireless resource Management Department 205 manages the wireless resource for every BS, and controls not to exceed the transmission capacity beforehand decided for every BS.
[0045] MS105 carries out the reception recovery of the subframe which each BS 101-104 transmits, is reassembled on a frame 303 according to the identifier and attribute of a subframe 305, performs a day interleave and error correcting code-ization, detects a frame 302, reproduces the information sequence 301, and restores the information on original.
[0046] A reverse link completely serves as a reverse procedure. In MS105, error-correcting-code-izing and an interleave are performed for the information sequence to transmit, and it distributes to each wireless port which has a modulation circuit and a RF circuit. This wireless port is equivalent to the wireless interface function of BS of a forward link. As for data distribution of a reverse link, MS opts for distribution based on Eb/No for every BS. On the other hand, when newly setting up a circuit, the monitor of the pilot signal from BS which is going to set up a circuit can be carried out, and

transmission speed can be decided by the Ec/Io.
[0047] The data concentrator 201 collects the information on the received reverse link as a format of a subframe 305. Furthermore, the data concentrator 201 extracts control information required for circuit quality control, such as the forward link FER. A buffer / multiplex section 202 once stores a subframe 305 in memory, and assembles it to the encoded sequence 304 according to the identifier and attribute of a subframe 305. the decode section 303 -- a sequence 304 -- a day interleave -- and decode processing is carried out. Finally the check of the quality is performed per frame, and the decoded data are transmitted to NW107. By the way, the transmission speed of each circuit is not always fixed. The transmission-speed control section 204 recalculates transmission speed again according to change of the circuit quality reported at any time.
[0048] (Example 2)
1. Explain the configuration of BSC more detailed than the structure of a system using drawing 4 . BSC consists of the uphill FER detector + buffer circuit 401, the multiplexing circuit 402, the day interleave circuit 403, a decoder circuit 404, the frame decomposition circuit 405, the output data interface 406, the downstream-transmission-speed control circuit 407, the transmission-speed table 408, the uphill all channel FER monitor circuit 409, the BS-IF circuit 410, the buffer + all transmission-speed control circuit 411, INTARIBA 412, a coding network 413, the frame composition circuit 414, a network and IF415, an interleave, a coding parameter table 417, etc.
[0049] The block diagram of BS is shown in drawing 5 . Two or more receive sections 533-1 - 533-n, and two or more transmitting sections 534-1 - 534-n are contained in BS that it should communicate with two or more terminals. The receive section of BS consists of the received high frequency circuit 501, the complex back-diffusion-of-electrons circuit 502, the rectangular back-diffusion-of-electrons circuit 503, DEINTARIBA 504, a decoder circuit 505, a going-down power control section 507, an Eb/NO monitor circuit 508, a channel FER detector 509, etc. On the other hand, the transmitting section consists of the transmitted RF circuit 510, the complex diffusion circuit 511, the gain control circuit 512, the rectangular diffusion circuit 513, the uphill power control-bit multiplex circuit 514, an interleave circuit 515, a coding network 516, a frame generation circuit 517, etc.
[0050] The terminal configuration of this invention is shown in drawing 6 . Two or more receive sections 633-1 - 633-n, and two or more transmitting sections 634-1 - 634-n are contained in MS105 that it should communicate with two or more BS. The receive section of MS consists of the received high frequency circuit 601, the complex back-diffusion-of-electrons circuit 602, the rectangular back-diffusion-of-electrons circuit 603, DEINTARIBA 604, a decoder circuit 605, going-down Ec/I0 detector 606, an uphill power control section 607, an Eb/NO monitor circuit 608, a FER detector 609, etc. On the other hand, the transmitting section consists of the transmitted RF circuit 610, the complex diffusion circuit 611, the gain control circuit 612, the rectangular diffusion circuit 613, the power control-bit multiplex circuit 614, an interleave circuit 615, a coding network 616, a frame generation circuit 617, etc.
[0051] A control section common to two or more transceiver sections is shown in drawing 7 . The common control section 735 consists of a buffer circuit 718, the multiplexing circuit 719, the day interleave circuit 720, a decoder circuit 721, the frame decomposition circuit 722, data output IF723, the uphill transmission-speed control circuit 724, the going-down link FER monitor circuit 725, the transmission-speed table 740, the distribution circuit 726, a buffer and all the transmission-speed control circuits 727, INTARIBA 728, the decryption circuit 729, the frame generation circuit 730, input data IF731, the wireless resource Management Department 732, an interleave, a coding parameter table 742, etc.
[0052] 2. Explain system behavior, next actuation of a forward link. The frame generation circuit 414 of BSC carries out part division of the input data from a network per frame, and adds a signal still more nearly required for information discernment at a receiving side (630A). A coding network 413 error-correcting-code-izes the output of the frame generation circuit 414. The INTARIBA circuit 412 is interleave-ized by changing informational permutation (628A). The wireless resource Management Department 416 gives the coding parameter and interleave parameter at this time. Then, a buffer / full

speed control circuit 411 determines the total transmission speed of the information transmitted from two or more BS. The forward link transmission-speed control circuit 407 computes the transmission speed for every circuit based on Eb/No of each forward link, an Ec/Io value, or FER as well as the frame error rate (henceforth, FER) of all the forward links transmitted by the reverse link. Control of this transmission speed is performed in consideration of the wireless resource usage of all BS that a BSC subordinate has. Then, a signal distributes the BS-IF circuit 410 to each BS correspondence (626A). The BS-IF circuit 410 becomes irregular respectively, and carries out the radio transmission of the signal (626A) separated for every BS.

[0053] BS equips a forward link with two or more transmitting sections 534-1 - 534-n (n is the two or more natural numbers). The frame generation circuit 517 performs frame-ization so that the wireless interface between BS and MS may be suited (617A). A coding network 516 error-correcting-code-izes the output of a frame generation circuit. The interleave circuit 515 changes that of permutation data for interleave-izing (615A). The reverse link power control-bit multiplex circuit 514 adds power control information to the output of the interleave circuit 515. The rectangular diffusion circuit 513 carries out quadrature modulation of the output of an interleave circuit. The gain control circuit 512 adjusts transmitted power gain. The complex diffusion circuit 511 performs complex diffusion to the information to which transmitted power gain was adjusted. The RF circuit 510 changes the information after complex diffusion into a transmit-frequencies signal, and transmits it to MS.

[0054] Next, the forward link receiving component and function of MS are explained using drawing 6 and 7. Two or more receivers 633-1 - 633-n (n is the two or more natural numbers) are carried in MS105 so that two or more circuits can be received to coincidence. Each receiver operates independently respectively. As for the signal received in the received RF circuit 601, collating of a cel is performed in the complex back-diffusion-of-electrons circuit 602. Then, a channel is identified in the rectangular back-diffusion-of-electrons circuit 603, and an error correction is performed by the day interleave circuit 604 and the decoder circuit 605. The reverse power control circuit 607, the Eb/No monitor circuit 608, and the FER detector 609 are carried in a receiver, and it controls with the monitor for power control.

[0055] In MS common control section 735, the output of each receiver is brought together in a buffer circuit 718. Timing adjustment is performed here and multiplexing of each received data is performed in the multiplexing circuit 719. Since the interleave of the multiplexed data is carried out in the interleave circuit 628 of BSC, they perform actuation of returning permutation in the day interleave circuit 720 of MS common control section 735. Error correction actuation is performed by the after decoder circuit 721. The original data are extracted after that in the frame decomposition circuit 722, and the output data 723 are transmitted to the data-processing section of a terminal equipment. In this process, decoder-circuit 721 output detects FER of all forward links in a forward link FER monitor circuit. This FER information is transmitted to BSC via BS by the reverse link.

[0056] The synthetic example of the frame in the case of receiving by MS is explained. It gets over independently with MS receiver, and each circuit from BS is set to subframe 718A. Quality (QI) is checked while ID and an attribute are read here. The sequence which multiplexes the signal received by two or more circuits according to the array of ID is read. With an attribute, a control signal etc. changes priority and processing is performed. Only the information sequence of subframe 718A is taken out and multiplexed. Since an interleave and FEC are still performed, information 719A after multiplexing cannot be taken out. The permutation of the signal by which the interleave was carried out between circuits is returned first in the day interleave circuit 720. Then, the error correction of the signal FEC(ed) in the decoder circuit is carried out, and frame 721A is reproduced. It is the signal which 722A should receive except for overheads, such as ID.

[0057] Next, a reverse link is explained. The frame generation circuit 730 of MS105 divides the input data from a data terminal device per frame. This frame is error-correcting-code-ized by the coding network 729, and informational permutation is changed in the INTARIBA circuit 728. MS wireless resource Management Department 732 gives the coding parameter and interleave parameter at this time. Then, a buffer / full speed control circuit 727 determines the total transmission speed of the information which should be transmitted to two or more BS. This control is set up by the reverse link transmission-

speed control circuit 724 based on Eb/No of each reverse link, or FER as well as the frame error rate of all the reverse links transmitted by the forward link. The wireless resource usage (example: the frequency of a connectable circuit, a sign, time slot) of all BS to which MS can connect this control must be taken into consideration. Then, a signal can distribute to BS correspondence in the distribution circuit 726. A transmitter is assigned to each BS correspondence at one to one.

[0058] Frame-ization is performed in the frame generation circuit 717 so that the wireless interface between MS and BS may be suited with the transmitter of MS. Each transmitter of MS modulates respectively the signal separated for every BS according to an individual, and is transmitted. In the example of drawing 7 , it error-correcting-code-izes by the coding network 716, permutation is changed in the interleave circuit 715, power control information is added to the data by the reverse link power control-bit multiplex circuit 714, and quadrature modulation is performed in the rectangular diffusion circuit 713, and after transmitted power gain adjustment in the gain control circuit 712, and the modulation by the complex diffusion circuit 711, it is changed into a transmit-frequencies signal in the RF circuit 710, and is transmitted to BS.

[0059] Next, the reverse link receiving component and function of BS and BSC are explained. Two or more receivers 533-1 - 533-n are carried in BS so that two or more circuits can be received to coincidence. Each receiver operates independently respectively. The complex back-diffusion-of-electrons circuit 502 performs the complex back diffusion of electrons in order to take MS sending signal and a synchronization for the signal which the received RF circuit 501 received. Then, the rectangular back-diffusion-of-electrons circuit 503 performs the rectangular back diffusion of electrons for the information after the complex back diffusion of electrons, and identifies a channel. The day interleave circuit 504 and a decoder circuit 505 carry out an error correction to the information after the rectangular back diffusion of electrons. The forward power control circuit 507, the Eb/No monitor circuit 508, and the FER detector 509 are carried in a receiver, and it controls with the monitor for power control.

[0060] In BSC, the output of each BS receiver is brought together in the reverse FER detector + buffer circuit 401. The reverse FER detector + buffer circuit 401 adjusts the timing of received data. The multiplexing circuit 402 multiplexes each received data. The interleave of the multiplexed data is carried out in the interleave circuit 728 of MS common control section 735. Then, the day interleave circuit 403 of BSC performs actuation of returning permutation. The after decoder circuit 404 carries out an error correction. After that, the frame decomposition circuit 622 extracts the original data, and transmits the output data to NW. The reverse link FER monitor circuit 409 detects FER of all reverse links based on the output of a decoder circuit 404. This FER information is transmitted to MS105 via BS by the forward link.

[0061] In above-mentioned explanation, as for the transmitter-receiver of BS and MS, the RF circuit is set up separately, and the circuit between MS and Plurality BS is described on the assumption that it is set up on a different frequency. As long as it is the case where this is applied to TDMA, circuit allocation may be identified by the time slot using the same frequency. Moreover, employment with single frequency is possible for the thing in which a multiple-line setup on one frequency is possible like CDMA by performing interference control of timing reservation etc. in advance of transmission and reception.

[0062] 3. Control approach 3.1 of transmission speed About a forward link, MS105 obtains a circuit with BS with best Eb/No, when Ec/Io of a pilot signal connects with best BS. However, if it exceeds the lower limit from which Eb/No required to maintain the transmission speed which needs Ec/Io for systems operation and circuit quality of the pilot signal which other BS transmits is obtained, the circuit can also communicate by choosing transmission speed appropriately and making it correspond. Although MS has a possibility that may be interfering and transmission speed may fall when it receives from two or more BS to coincidence since CDMA is assumed to the present explanation at this time, transmission speed can be raised by using a circuit (slot) reservation method, for example. However, in order to also take into consideration application at an another side ceremony, such as TDMA, and to go ahead with the talk simply, between each circuit of MS and Plurality BS, interference is suppressed by

extent which does not have trouble in systems operation by the frequency or time sharing, and it is assumed that it is that from which a signal is separated enough here.
[0063] The cross connection approach is shown below.
[0064] (1) MS carries out the monitor of two or more pilot signals, and sets up the priority which should be connected by Ec/Io.
[0065] (2) MS makes connection by the access channel to BS1 to connect.
[0066] (3) If connection is completed, MS will report the pilot signal which can connect with BSC106, and its Ec/Io with data request to receipt via connected BS101. MS105 combines and notifies information, such as classification (example: classification of a control line) of the frequency which can be supported, a sign channel, the transmission speed which can be transmitted and received, and the circuit which can be supported. BSC106 identifies BS by ID of a pilot signal. BS102,103 assumes that connection is still more possible.
[0067] (4) it knows that BSC can connect ID to BS102,103 of a pilot signal -- check whether the wireless resource of BS102,103 can assign MS105.
[0068] (5) The circuit (the frequency, the sign, timing), transmission speed which will be assigned with ID (pilot signal) of BS102,103 if possible It notifies to MS105 by the BS101 course which is making current connection. When impossible, it goes into a waiting state, and the process of (3)-(4) is repeated. It is a time-out by the case.
[0069] (6) MS105 sets up reception of the circuit specified about BS102,103.
[0070] (7) MS105 starts reception by the circuit as which BS101,102,103 was specified.
[0071] (8) BSC106 encodes by choosing the parameter of error-correcting-code-izing or an interleave according to transmission speed, distributes a signal for every BS, and starts transmission.
[0072] (9) MS105 supervises receiving quality at any time. Monitor parameters are each Eb/No of BS101,102,103, FER, and FER after multiplex. These values are the time intervals defined beforehand, and are reported to BSC using the control channel of dedication. Moreover, the monitor of Ec/Io is carried out, and also when BS in which new connection is possible appears, it reports to BSC.
[0073] (10) BSC106 adjusts transmission speed, carrying out the monitor of (9). Circuit quality is reported by Eb/No or FER. Transmission speed is lowered when the channel quality of Specification BS deteriorates. Conversely, transmission speed is gathered when it has improved. Priority of the FER quality after multiplex is made the highest.
[0074] (11) When a specific circuit cannot maintain the quality specified even if it lowered transmission speed to the minimum, make the circuit into ** and continue a communication link by the remaining circuits.
[0075] (12) A hand off does not carry out. They are only a line connection and **.
[0076] 3.2 The cross connection approach is shown below about a reverse link.
[0077] (1) MS carries out the monitor of two or more pilot signals, and sets up the priority which should be connected by Ec/Io.
[0078] (2) MS makes connection by the access channel to BS101 to connect.
[0079] (3) If connection is completed, MS105 will report the pilot signal and Ec/Io of Ec/Io to BSC106 with a data Request to Send via connected BS101. BSC106 identifies BS by the pilot wave.
[0080] (4) BSC106 prepares connection of ID to BS102,103 of a pilot signal. It checks whether the wireless resource of BS102,103 can assign MS105.
[0081] (5) The circuit (the frequency, the sign, transmit timing), transmission speed which will be assigned with ID (pilot signal) of BS102,103 if possible It notifies to MS105 via BS101 which is making current connection. When impossible, it goes into a waiting state, and the process of (3)-(4) is repeated. It is a time-out by the case.
[0082] (6) MS105 sets up transmission by the circuit as which BS102,103 was specified.
[0083] (7) MS105 starts transmission by the circuit as which BS101,102,103 was specified.
[0084] (8) MS105 encodes by choosing the parameter of error-correcting-code-izing or an interleave according to the specified transmission speed, distributes a signal for every BS, and starts transmission.
[0085] (9) BSC106 supervises receiving quality at any time. Monitor parameters are Eb/No of the signal

received in each of BS101,102,103, FER, and FER after BSC multiplex. These values are the time intervals defined beforehand, and are reported to MS105 using the control channel of dedication. Moreover, MS105 is carrying out the monitor of Ec/Io, and when BS in which new connection is possible appears, it reports it to BSC106.
[0086] (10) MS105 adjusts transmission speed, carrying out the monitor of (9). Circuit quality is reported by Eb/No or FER. Transmission speed is lowered when circuit quality with Specification BS deteriorates. Conversely, transmission speed is gathered when it has improved. Priority of the FER quality after multiplex is made the highest.
[0087] (11) When a specific circuit cannot maintain the quality specified even if it lowered transmission speed to the minimum, make the circuit into ** and continue a communication link by the remaining circuits.
[0088] (12) A hand off does not carry out. They are only a line connection and **.
[0089] 4. The transmission speed of the setting approach circuit unit of transmission speed can be set up by a desired signal and a desired interference noise power ratio, and shows an example of the correspondence to drawing 8 (a). This correspondence table is stored in the store circuit of a downstream-transmission-speed control circuit (407 or 724). The transmission speed used as criteria is determined now, and also changes transmission speed corresponding to fluctuation of circuit quality. Moreover, since actual circuit quality was estimated by FER in many cases, it was also appended to drawing 8 (a). Selection of a circuit quality parameter (example: FER, Ec/Io, Eb/No) may be changed by the time of a message etc. at the time of cross connection.
[0090] The transmission speed after multiplexing is given by total of the transmission speed of an usable circuit. However, it is necessary to take into consideration interference between this usable circuit at this time. That is, since interference is mutually produced between circuits when using the same frequency and the same time slot, a different interference from Eb/No currently guessed at the time of Ec/Io measurement is measured, and circuit quality may be satisfied by degradation of FER. for this reason -- drawing 8 (b) -- interference -- allowances -- the margin is prepared. Between the channels using the same frequency or the same time slot, interference allowances are given using this successive diminution multiplier. This correspondence table is stored in the store circuit of a downstream-transmission-speed control circuit (407 or 724).
[0091] Even after dividing information into a circuit, the interleave between the circuits by the interleave circuits 412 or 728 needs to set up the interleave size so that degradation of the burst error by phasing etc. may be oppressed enough. Therefore, this size is adjusted according to the transmission-speed ratio between the number of circuit to separate and a circuit. The example of a table is shown in drawing 8 (c). Moreover, in order to raise circuit quality by coding gain, the parameter (example: restricted length, rate of coding) of a coding method may be adjusted. The parameter of an interleave and a coding method is the wireless resource Management Department (407 or 732). It is stored in the store circuit.
[0092] 5. Tail Bit for ID from which input data 631A divided into the distribution approach frame length of data which transmits discriminates a frame, an attribute, a quality index (QI), and FEC is added (630A). After redundancy is added to this frame by FEC, it is set to interleaved sequence 628A. Sequence 628A is divided into two or more sequences according to the transmission speed as which the above-mentioned was determined. Quality indexes, such as sequence of a sequence, ID which gives the address, an attribute which gives data classification information, and CRC, are given to each information sequence, and it becomes the subframe of 626A, and is transmitted to BS from BSC. The decision of the distribution place which distributes the information sequence of 627A to BS is controlled so that each circuit quality of transmission speed, and BS and MS which is performed as a smallest unit and shows the period which checks circuit quality to drawing 8 corresponds.
[0093] When, as for a certain circuit, transmission speed falls with fluctuation of circuit quality, data may be in the state waiting for transmitting in a buffer circuit 411. In this case, when other circuits have allowances in transmission speed to that permission transmission speed, data are changed to other circuits, without considering as a transmitting waiting state.
[0094] Transmission speed in case the circuit is set as drawing 9 between MS and three BS, and the

example of allocation of a signal are shown. In this drawing, at the time of the highest transmission speed per circuit, it shall time-amount-interval(tn and time interval of tn-+-1 )-hit, and four data blocks shall be transmitted about the data block which evaluates circuit quality and which carried out the interleave. In the minimum transmission speed, one data block per time amount interval shall be transmitted. This transmission speed is determined by the circuit quality evaluation parameter shown in drawing 8 , such as Ec/Io, Eb/No, and FER. If its attention is paid to CH1, since all have circuit quality in a record level during time of day t1-t5 as for CH1, transmission speed will also serve as max. On the other hand, in CH2, between time of day t1 - t5, since communication link quality has deteriorated in proportion to time amount, transmission speed also deteriorates in proportion to it. Furthermore, between time of day t1 - t2, since circuit quality is the minimum, only one data block can send CH3. However, since circuit quality improved at time of day t3, it is possible to send 3 data slot.

[0095] Allocation of the transmit data after an interleave gives priority to and distributes what has good circuit quality, and transmits it previously. This is for being the conditions according to an early and propagation environment, and transmitting as many signals as possible as much as possible, after circuit quality data (Eb/No, Ec/Io, FER) reception.

[0096] (Example 3) MS105 carries out call origination and the example of operation in the case of setting up two or more circuits is explained using drawing 10 . If MS call request is judged (1000), MS105 will transmit a call request (1001). In this case, the channel which transmits a call request is used. This is henceforth called an access channel. MS105 performs a call request to BS by which registration is made using an access channel. However, this access channel is ability ready for receiving in two or more BS, and this may be used, as long as composition of the access channel input signal from two or more BS is possible in BSC106 like other traffic channels and it is.

[0097] A traffic channel is set up between MS105 and BS101, and it is assumed that communication service was started (1002-1011). The case where the information which runs short of capacity only by the circuit with BS101 and to upload is in MS105 is assumed. MS105 requires the high-speed transport service by multi-BS transmission from BS (1040). At this time, MS105 transmits the pilot signal and the list of statistics on the strength (example: Ec/Io) of BS of the level beyond a certain threshold which MS105 has received to BSC106 (1022). Based on the received list information, BSC106 looks for BS which may be able to communicate with MS105, and it investigates whether assignment of a wireless resource is possible (1023). If BS102 is judged that a communication link is possible by BSC106 here, BSC106 will apply the activate request of a circuit to MS105 to BS102 (1024-1025). At this time, BSC106 permits cross connection with BS102 to MS105 by the hand-over activate request via BS101 (1026-1027). A circuit is newly set up by the same approach as MS105 and BS102, i.e., the conventional hand-over, and, as for MS105, a communication link becomes possible via BS101 and BS102 (1028-1030). While distributing and transmitting MS105 to the rate which was adapted for each circuit quality after it error-correcting-code-izes information to transmit and carries out an interleave if a communication link is started between BS101 and BS102 with MS105, BSC106 multiplexes the signal received by BS101,102, and day interleave ** decodes it, and it reproduces a signal sequence (1031-1032). Although it is also the same as that of the above when the number of BS is three or more, the places where a hand-over message becomes two or more differ.

[0098] In the above, although it is dependent on the received signal power and circuit quality between MS and BS when BS connected previously makes connection **, this mentions later. A BS/BSC side carries out call origination, termination is carried out by MS, and the example in the case of setting up two or more circuits is explained using drawing 11 .

[0099] BSC106 will transmit a paging message (Page Message) from BS into which MS105 is registered, if the paging demand of MS105 is received from a network (1100) (1101). By MS receiving and compounding the paging message from two or more BS at this time, as long as a recovery is possible, that approach may be used. The communication procedure of MS and BS101 into which it is registered is the same as the conventional approach (1102-1112). If communication service is started (1113) and there is a demand of the high-speed data service using multi-BS from the BSC side (1130), BSC106 will transmit a demand message via BS101 (1114). At this time, BSC106 may carry out the

monitor of the signal of this MS105 to two or more BS beforehand, and may transmit BS which can serve as a candidate of connection with the message of the first half. MS105 transmits the pilot signal of the signal power beyond a certain fixed threshold, and its list to BSC by BS1 course to the above-mentioned message (1115). Based on the list information on MS105, BSC106 determines BS which serves as a candidate, and assigns a wireless resource. The radio channel of BS102 shall be assigned (1116-1118). BS101 transmits the hand-over start up message to BS102 to MS105 (1119). MS105 carries out setting initiation of the circuit with BS102, with a circuit with BS101 held (1120). MS105 sets up a circuit with BS102 by the same approach as the conventional hand-over (1121-1123).

[0100] If a circuit will be set MS105 as BS101,102 and coincidence, BSC106 will error-correcting-code-ize information which should be transmitted, and will distribute it to each of BS101,102 with the transmission speed corresponding to circuit quality after an interleave. BS101,102 is transmitted by coding and a cel (sector) signal setup which are set up independently, respectively. In MS105, after restoring to the signal from BS101,102 as an input-signal sequence which became independent respectively, it multiplexes, and decodes after a day interleave and an information sequence is reproduced (1124-1125). Although it is also the same as that of the above-mentioned when the number of BS is three or more, the places where a hand-over message becomes two or more differ.

[0101] (Example 4) The outline of the approach of hand-over is explained using drawing 12 . The succeedingly detailed example of a sequence is explained using drawing 13 . In drawing 12 , BS 101-104 has each service area, and each service area is overlapped partially as mentioned above. The case where MS105 which is present in the area of BS101 moves to the area of BS104 is considered. In drawing 12 (a), since MS105 is in the field which can obtain service only from BS101, it has not connected the circuit in other BS 102-104. In drawing 12 (b), MS105 is moving to the boundary of the area of BS101 and BS103. MS105 set up both BS and circuits, and has transmitted and received information which is different with the transmission speed corresponding to Eb/No of each circuit. At drawing 12 (c), MS105 is BS101,103,104. It is in a cel field and these three BS and circuits are set up. However, it is outside the cel range of BS102. MS105 can obtain BS103 and best Eb/No, and is communicating with a high transmission speed. Since the circuit with BS101 has bad circuit quality, it has a low speed. Drawing 12 (d) is the example which MS105 moved to the field in which all BS and connection of BS 101-104 are possible. Also in this case, four circuits have transmitted a different information sequence with the transmission speed according to interference conditions.

[0102] Next, concrete actuation of hand-over is explained using drawing 13 . It is assumed that MS105 is connected to both BS101 and BS102 (1300). MS105 is controlling transmission speed according to an interference condition, performing power control with two BS. Moreover, at least one of two or more circuits shall be set to high priority, and the priority of transmission and reception shall be granted. This ranking specifies the priority of the reservation approach of a circuit, the importance of a signal to transmit. Here, it is assumed that a high priority is first given to BS101 and a communication link is continued (1301 1302).

[0103] Release of the circuit under connection by hand-over is performed by the same procedure as the hard hand-over which delivers a circuit between the systems by which the conventional frequencies differ. However, transmission and reception of a control signal are performed only using the high circuit of a priority.

[0104] If there are some which have the conditions of the high circuit of priority in others when the signal strength becomes low and is less than a threshold (1303), although the signal from BS101 is in high priority (1304), a high priority will be changed to BS102 at least 1 of them, and here. MS reports the candidate list of new BS while notifying modification of BS priority to BSC (1305) (1306). The actuation in the case of newly connecting BS is almost the same as actuation of drawing 10 . If Ec/Io from BS101 deteriorates rather than a threshold, while MS105 directs to lower transmission speed to BS101, the transmission speed from MS105 is also lowered (1309).

[0105] If Ec/Io deteriorates below in a threshold with difficult maintenance of a circuit with BS101 (1308), MS105 will report the list of new BS to BSC106 (1309), it will notify releasing the circuit of BS101 (1310), and the communication link with BS101 will be ended (1312). BSC106 releases the

wireless resource of BS101 (1313). The circuit only with BS2 is maintained in this example (1314).
[0106]
[Effect of the Invention] There is the following effectiveness in this invention.
[0107] (1) The available wireless resource accompanying BS arrangement is utilizable for the maximum. That is, though MS is in the good electric-wave environment which is below in a fixed interference noise power threshold from two or more BS, it has already connected with one circuit and it becomes possible to communicate with the transmission speed according to circuit quality with other BS to MS which cannot use a circuit with other BS. As a result, improvement in transmission speed is possible between MS and BSC.
[0108] (2) Don't connect the same traffic concurrently to two or more BS like software hand-over at the time of ** of the circuit accompanying migration of MS, and connection. However, since the signal which carried out the interleave to FEC is distributed between circuits, even if informational disappearance arises in some circuits, in order to compensate the signal deficit between BS using coding gain, little communication link of a data deficit is attained at the time of the circuit change between MS-BS.
[0109] (3) Even if the circuit between a certain BS and MSs deteriorates temporarily, even if one circuit quality deteriorates since the error correction and the interleave are performed between the circuits which distribute information, the property after a recovery is improvable after other circuits and multiplexing using coding gain.

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## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the radio approach and a radio communication equipment, and relates to the radio approach especially set up and employed between a terminal, a base station, and a base station controller in radio communications systems, such as a cellular communication system.

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PRIOR ART

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[Description of the Prior Art] Although communicating with one base station is most, in the case of hand-over, a terminal connects the conventional terminal with two or more base stations exceptionally. For example, as an example of the conventional technique, there are USP 5, 101, and 501, USP 5, 267, and 261, USP 5, 088, and 108, USP 5, 109, and 528, USP 5, 327, and 577, and invention indicated by the ****** No. 511835 [ ten to ] official report.
[0003] The service area of a base station is made to overlap a radio communications system between adjoining base stations generally that the continuity of communication service should be guaranteed. A handover is performed in this overlapped field. Although a terminal performs two or more base stations and line connections in the case of a handover, the data of the same contents are transmitted and received for any circuit.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] There is the following effectiveness in this invention.
[0107] (1) The available wireless resource accompanying BS arrangement is utilizable for the maximum. That is, though MS is in the good electric-wave environment which is below in a fixed interference noise power threshold from two or more BS, it has already connected with one circuit and it becomes possible to communicate with the transmission speed according to circuit quality with other BS to MS which cannot use a circuit with other BS. As a result, improvement in transmission speed is possible between MS and BSC.
[0108] (2) Don't connect the same traffic concurrently to two or more BS like software hand-over at the time of ** of the circuit accompanying migration of MS, and connection. However, since the signal which carried out the interleave to FEC is distributed between circuits, even if informational disappearance arises in some circuits, in order to compensate the signal deficit between BS using coding gain, little communication link of a data deficit is attained at the time of the circuit change between MS-BS.
[0109] (3) Even if the circuit between a certain BS and MSs deteriorates temporarily, even if one circuit quality deteriorates since the error correction and the interleave are performed between the circuits which distribute information, the property after a recovery is improvable after other circuits and multiplexing using coding gain.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] Which cellular wireless terminal may be in the electric-wave condition which can communicate with other base stations with a certain fixed transmission speed the base station of 1, and during a communication link. Such an electric-wave environment mainly has few other users, and when an empty circuit exists, they are generated. [ many ] since the number of users connectable with a base station is determined as coincidence in CDMA (code division multiple access standard) by the interference power ratio with other terminals, if other terminals are in few situations -- since interference power is small -- other base stations -- coincidence -- **** -- it becomes the electric-wave environment [-izing / an environment ]. However, in the conventional system, even if it suits such an electric-wave environment, since it connects only with one base station, a terminal has the technical problem that it will be restricted to the maximum of the circuit whose transmission speed is one. On the other hand, although a terminal may be connected to two or more base transceiver stations and coincidence for a handover, each circuit connectable with this coincidence can send only the same information on the property of a handover. Therefore, since it is the structure which can transmit and receive only the same information as the circuit under current connection in other wireless circuits even if it suits the electric-wave condition in which connection with other base stations is possible using other wireless circuits, the result which cannot use a wireless resource effectively is caused. After all, in transmission, the technical problem that transmission speed will be restricted at the maximum per circuit occurs.
[0005] When it is in an electric-wave environment connectable also with the base station of 1, and the base transceiver station of others [ terminal / under connection ] in view of the above-mentioned technical problem, the purpose of this invention is connecting with other base transceiver stations at coincidence, and aims at raising transmission speed by distributing and sending the information which should be transmitted and received by the terminal and network side.
[0006] Moreover, in case it communicates to two or more base transceiver stations and coincidence, line speed is determined according to the electric-wave environment, and it aims at effective use of a wireless resource, and offering the communication service stabilized more in each base transceiver station.
[0007] Furthermore, when an electric-wave environment gets worse two or more base transceiver stations and during a communication link, it aims at offering the dynamic communication service according to an electric-wave environment by carrying out adjustable [ of the transmission speed ] according to it, or occasionally cutting a circuit.
[0008] Furthermore, it aims at distributing and transmitting to a circuit with two or more base stations, after it error-correcting-code-izes information to transmit and it carries out an interleave, multiplexing by carrying out a day interleave, after multiplexing the circuit written in a receiving side, and carrying out error correction decode, even if the communication link quality of some circuits deteriorates, and suppressing degradation of the signal after an error correction low.
[0009] Furthermore, in this invention, if an electric-wave environment avoids, a high-speed circuit will be assigned, but if an electric-wave environment gets worse, it will aim at offering wireless service best-

effort by making the transmission speed into a low speed.

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MEANS

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[Means for Solving the Problem] The receiving set which receives the signal from two or more base stations that the wireless terminal of the invention in this application should solve an above-mentioned technical problem, The communication link quality calculation equipment which computes each communication link quality of two or more signals received with said receiving set, The rate calculation equipment which computes the transmission speed which can be transmitted for said every base station based on each communication link quality computed by said communication link quality calculation equipment and which can be transmitted, It has the division equipment which divides the information which should be transmitted for every aforementioned base station based on each transmission speed computed by said rate calculation equipment which can be transmitted, and the sending set which transmits the information divided by said division equipment to each aforementioned base station.
[0011] Moreover, in the invention in this application, a signal pair interference wave power ratio (for example, Eb/N0, Ec/I0, or these should put together) is used as communication link quality.
[0012] Moreover, the receiving set with which the wireless terminal of the invention in this application receives the signal from said base station, The Eb/N0 calculation equipment which computes signal pair interference wave power ratio Eb/N0 of the signal received with said receiving set, The signal pair interference wave power ratio calculation equipment which computes ** received with said receiving set, based on said signal pair interference wave power ratio with the transmission-speed calculation equipment which computes the transmission speed (or -- from said base station) to said base station The table listing device which creates the table to which make the transmission speed computed by said transmission-speed calculation equipment come to correspond for said every base station, It has the store which memorizes the table created by said table listing device, the division equipment which divides communication link information for said two or more base stations of every based on the table memorized by said store, and the sending set which transmits the communication link information divided by said division equipment to each base station.
[0013] Moreover, the storage with which the base station control station of the invention in this application memorizes the communication link quality of the transmission line of said wireless terminal and each aforementioned base station, The transmission-speed calculation equipment which computes the transmission speed which should be adapted for every base station based on the communication link quality for every base station memorized by said storage, It has the division equipment which divides communication link information for every base station based on the transmission speed for every base station computed by said transmission-speed calculation equipment, and the sending set which transmits the communication link information divided by said division equipment to said each base station. in addition, the wireless terminal or the base transceiver station collected communication link quality for every channel -- it comes out.
[0014] Moreover, the wireless terminal of the invention in this application is equipped with the receiving set which receives the information-sharing instruction signal transmitted from any one of base stations, the division equipment which divides the information which should be transmitted for every aforementioned base station based on the information-sharing instruction signal received by said

receiving set, and the sending set which transmit the information divided by said division equipment with the transmission speed which was able to be defined for every aforementioned base station. In addition, the transmission speed for every base station and the rate of division are contained in an information-sharing instruction signal, as for said division equipment, information is divided into it for every base station based on the rate of said information-sharing instruction signal ********** aforementioned division, and said sending set transmits to it the information divided by said division equipment based on said transmission speed contained in said information-sharing instruction signal for every aforementioned base station.

[0015] In addition, a transmission-speed control signal may be used instead of an information-sharing instruction signal, and you may constitute so that information may be divided for every base station based on the transmission speed contained in this transmission-speed control signal.

[0016] Two or more base stations where the correspondence procedure of the invention in this application communicates with a wireless terminal and said wireless terminal, It is the correspondence procedure of the communication system containing the base station control station which controls said base station. Each communication link quality of two or more transmission lines between said wireless terminal and said two or more base stations is computed. Based on said each computed communication link quality, the transmission speed which can transmit said wireless terminal is computed for said every base station. Based on said each computed transmission speed, information is distributed for every aforementioned base station. Said distributed information is transmitted with the transmission speed defined for every aforementioned base station to said base station corresponding to each. Said distributed information is received in each aforementioned base station, each aforementioned base station transmits said received information to said base station control station, and said base station control station receives the information which each aforementioned base station transmitted, and re-compounds the information from said each received base station in said base station control station.

[0017] Moreover, the correspondence procedure of the invention in this application computes each communication link quality of two or more transmission lines between a wireless terminal and two or more base stations. Based on said each computed communication link quality, said each base station computes the transmission speed which can be transmitted to said wireless terminal. Said base station control station The information which should be transmitted to said wireless terminal is distributed for every aforementioned base station based on said each computed transmission speed. Each aforementioned base station It transmits with the transmission speed which was able to define said distributed information for every aforementioned base station, said wireless terminal receives the information which each aforementioned base station transmitted, and said wireless terminal re-compounds the information from said each received base station.

[0018] In addition, although a wireless terminal or a base station computes the communication link quality of a transmission line, when a wireless terminal computes, it may report communication link quality to a base station control station through a base station. A base station control station computes transmission speed based on such communication link quality. In addition, you may compute in a wireless terminal or a base station.

[0019] Moreover, the communication system of the invention in this application consists of two or more base transceiver stations which communicate through a wireless terminal, said wireless terminal, and a communication line, based on the circuit quality of a communication line, selects the communication line which should be used for a communication link, and makes high-speed transmission possible by communicating through the communication line which had the selected communication link information which divided communication link information for every communication line, and was divided selected.

[0020] Moreover, the communication system of the invention in this application makes possible ** which makes signal degradation after multiplexing the minimum, even if a part of communication line quality deteriorates, in order to perform an error correcting code and an interleave by the transmitting side before division of communication link information and to perform day interleave decode after multiplex by the receiving side.

[0021] Moreover, the transmission-speed calculation equipment which computes the receiving transmission speed for which the base station control station of the invention in this application should be adapted for this every base station based on the receiving quality for every base station, The sending set which transmits the receiving transmission speed for said every base station which said transmission-speed calculation equipment computed to said wireless terminal via at least one base station, Said wireless terminal is equipped with the receiving set which receives the communication link information divided and transmitted for said every base station through this each base station, and the multiplexer which was received with said receiving set and which multiplexes division **** communication link information for every base station based on said receiving transmission speed which said sending set transmitted.

[0022] Moreover, the transmission-speed calculation equipment which computes the transmission speed which can be transmitted by said going-up circuit based on the signal pair interference wave power ratio of the going-up circuit of each base station where said each base station computed the base station control station of the invention in this application, it is said transmission-speed calculation equipment -- with the table listing device which creates the table to which said computed transmission speed is made to correspond for said every base station It has the multiplexer which multiplexes the storage which memorizes the table created by said table listing device, and two or more communication link information which said wireless terminal divided into said two or more base stations so much, and transmitted to them based on the table memorized by said storage, and is restored to the information before division.

[0023] Moreover, the communication link quality calculation equipment which said two or more base stations get down from the wireless terminal of the invention in this application, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, Said rate calculation equipment which said communication link quality calculation equipment computed, which gets down and computes the transmission speed which can be transmitted by each going-down circuit of each of said base station based on each communication link quality for every signal and which can be transmitted, The sending set which transmits the transmission speed of each of said base station which said rate calculation equipment which can be transmitted computed to said base station control station via at least one base station, It has the multiplexer which multiplexes the communication link information which said base station control station divides and transmits for said two or more base stations of every based on said transmission speed based on this transmission speed, and is restored to the information before division.

[0024] Moreover, the communication link quality calculation equipment which two or more base stations get down from the wireless terminal of the invention in this application, and is transmitted through a circuit and which gets down and computes the communication link quality of a signal, The sending set which transmits said communication link quality to said base station control station through said one of base stations, The receiving set which receives the communication link information which said base station control station got down based on said communication link quality, the transmission speed for every circuit was computed, and said plurality got down based on said computed transmission speed, divided for every circuit, and was transmitted, It has the multiplexer which multiplexes said communication link information which said receiving set received based on said transmission speed.

[0025] Moreover, in the invention in this application, the following correspondence procedures are adopted that an above-mentioned technical problem should be solved.

[0026] (1) In terminal dispatch, in an access channel and base station dispatch, set up one wireless circuit between a terminal and one base station by the paging channel. This is the same as the conventional wireless cross connection approach depended cellular.

[0027] (2) Assume the case where there is a high-speed transmission demand further and the transmission or receiving capacity is in a terminal using another channel rather than the transmission speed specified in either the terminal, the base station and the base station controller. The circuit which set up the control signal power of 1 or two or more base stations including the base station under received connection by the above-mentioned (1) reports a terminal to a base station and a base station

controller. For example, in the case of CDMA, pilot signal power is reported.
[0028] (3) A base station controller chooses the transmission speed in which the wireless resource for every base station and transmission and reception of a terminal are possible to a connection candidate's base station from the report result of (2). Furthermore, it judges whether a circuit is newly connectable to each candidate base station, and the transmission speed assigned from the interference noise power report for every candidate base station of a wireless terminal is determined as it.
[0029] (4) A base station controller reports to a terminal the transmission speed which can be assigned to the connectable list of other base stations, and each base station using the circuit set up by (1).
[0030] (5) A terminal sets up a circuit with new 1 or two or more new base stations according to directions of (4). This procedure is the same as the time of hand-over, if it removes that the number of base stations which it is newly going to connect may exceed 2.
[0031] (6) A base station controller notifies it to a terminal while checking completion of the cross connection in (5). It gets down, and by the circuit (it transmits to a terminal from a base station), a sending signal is compared to transmission speed and it distributes for every circuit, and for every base station, a base station controller regards it as the independent signal sequence, and becomes irregular, and it transmits to a terminal. After a terminal restores respectively independently to the signal received from 1 or two or more base stations for every circuit, it multiplexes them in order of a signal sequence, and reproduces the transmitted signal.
[0032] (7) In the case of an uphill circuit (it transmits to a base station from a terminal), a base station controller chooses a connection candidate base station from the result of (2). Furthermore, it judges whether a circuit is newly connectable with each candidate base station, and it gets down, the transmission speed of an uphill circuit is presumed and determined from the receiving level of a circuit, and it reports to a wireless terminal. At this time, a base station controller may report only the base station linked to a wireless terminal, and a wireless terminal may determine transmission speed. If a line connection procedure is completed between a wireless terminal and a base station controller, a terminal compares a sending signal to the transmission speed which can be transmitted between base stations, and distributes for every circuit, and to 1 or two or more base stations, it will become irregular respectively independently and will transmit. After a base station controller restores respectively independently to the signal received from 1 or two or more base stations for every circuit, it multiplexes them in order of a signal sequence, and reproduces the transmitted signal.
[0033] (8) Moreover, in the transmitting side of a base station controller and a terminal, in order to strengthen error proof stress, before distributing a signal for every circuit, error-correcting-code-izing and an interleave may be performed. In that case, in the receiving side of a base station controller, the rearrangement of the signal to which it restored in each base station is carried out with a base station controller, a day interleave is carried out to a transmitting side in the order of a foul trick, and an error correction decryption is performed. It is the same, and the receiving side of a terminal also carries out the rearrangement of the signal to which it restored by each receive port, carries out a day interleave to a transmitting side in the order of a foul trick, and performs an error correction decryption. When the quality of a certain circuit deteriorates rapidly by this among the circuits which have more than one, degradation of circuit quality can be minimized.
[0034] (9) After setting up two or more circuits between a terminal, a base station, and a base station controller, transmission and reception of the control information between a terminal and a base station controller may use any circuit.
[0035] (10) According to migration of a terminal, a terminal and the electric-wave condition between base stations change. Therefore, it is necessary to make a certain circuit into **, and it newly needs to set up a circuit. A communication link is maintained by performing a setup and discharge of a circuit an electric-wave environment and if needed for a user.
[0036] In addition, the transmission speed of the signal (uphill circuit) which a wireless terminal transmits judges whether based on the communication link quality which the base station control station received in each last base station, a wireless resource is usable with reference to a transmission-speed table, and is decided, and a base station control station notifies the determined transmission-speed

information to a wireless terminal via at least one base station.
[0037] Moreover, based on communication link quality with each base station received at the wireless terminal just before transmitting, a wireless terminal determines the transmission speed of the signal (getting down circuit) which a base station (base station control station) transmits with reference to a transmission-speed table. The information on transmission speed that each base station can be transmitted is notified to a base station control station via at least one base station from a wireless terminal. However, at a wireless terminal, since not all wireless resources are manageable, a wireless terminal may notify communication link quality with each base station to a base station control station, and a base station control station may determine transmission speed after judging the use propriety of a wireless resource.
[0038]
[Embodiment of the Invention] The maximum transmission speed of a digital communication system is determined by the ratio of digital signal power and interference noise power according to the modulation technique of the system. When the power per bit and the ratio of the interference noise power flux density per band define this, it is expressed with Eb/No in many cases. Moreover, it is also possible to apply by the integral value (Ec) covering PN chip period of pilot power and the total received-power spectrum consistency in a band (Io), and it is expressed in the system using periodic PN codes, such as CDMA, as a sign of a pilot signal by Ec/Io in this case in many cases. In addition, Eb/No and the scale which expresses other circuit quality instead of Ec/Io may be used. In this paper, it explains focusing on the example applied to CDMA, and these description is used below.
[0039] (Example 1) The configuration of the cellular system which applies this invention to drawing 1 is shown. A terminal (Mobile Station: henceforth, MS) 105 is connected with base stations 101-104 (Base Station: henceforth, BS) through a wireless circuit. Moreover, each BS connects with a base station controller 106 (Base Station Controller: henceforth, BSC) by the communication line. In addition, BSC connects with the network 107 of a high order. In addition, the circuit which each circuits 111-114 became independent of, respectively is characteristic at this invention, and it is the point that the information to which line speed is also transmitted also differs. That is, by distributing, transmitting and receiving the information usually transmitted and received through one BS to two or more BS, high-speed transmission is made possible as a whole.
[0040] The drawing which made drawing 1 more detailed is indicated in drawing 2 . In drawing 2 , since Ec/I0 of a circuit 111 is the highest, transmission speed is assigned most highly. Hereafter, according to Ec/IO, transmission speed is assigned also for circuits 112-114. In addition, the communication link of the wireless terminal 105 with the transmission speed of K+L+M+N is attained at the maximum under the interference control condition between circuits.
[0041] The configuration of BSC of this invention is explained using drawing 2 . A forward link consists of the buffer / the separation section 207 which performs control for separating the coding + interleave section 208 which encodes and carries out the interleave of the data from a network 107, and its output according to the transmission speed set up for every BS, and data distribution apparatus 206 which performs an interface function and data transmission with each BS. Moreover, a reverse link buffers the data concentrator 201 which collects the traffic and the control data from each BS, and its output, and consists of the day interleave + decode section 203 which decrypts by carrying out the day interleave of the buffer / multiplexing section which carries out multiplex restoration, and its output to the data of a basis. In addition, each configuration section of the above-mentioned forward link and a reverse link manages the usable wireless resource of each BS of the transmission-speed control section 204 and a BSC subordinate which assigns transmission speed, and includes the wireless resource Management Department 205 which distributes.
[0042] On the other hand, MS obtains the circuit of BS with best Eb/No, when Ec/Io of a pilot signal connects with best BS. However, if it exceeds the lower limit from which Eb/No required to maintain the transmission speed which needs Ec/Io for systems operation and circuit quality of the pilot signal which other BS transmits is obtained, the circuit can also communicate by choosing transmission speed appropriately and making it correspond. Here, Eb/No of a signal which received from BS 101-104 was

set to k, l, m, and n (k>l>m>n) at order, and corresponding transmission speed (bit per second: henceforth, bps) was set to K, L, M, and N (K>L>M>N). The wireless resource Management Department 205 manages the circuit quality k, l, m, and n of the circuit 111-114 detected by MS105 or BS 101-104. The transmission-speed control section 204 computes the possible transmission speed for every circuit for the circuit quality of each circuit stored in the wireless resource Management Department 205 based on read-out and this circuit quality. The transmission-speed control section 204 stores the transmission speed for every computed circuit as a table. In addition, although only four BS is indicated by drawing 1 and 2, you may be 4 or more and 4 or less.

[0043] Next, the going-down circuit which BS transmits is explained to an example. The information from NW107 will serve as the frame structure 302 with which the tail bit (Tail) was added, if a frame identifier (ID), a frame attribute (Type), and continuing error correcting code-ization assume that it is convolutional code-ization for every specified information [ which is shown by 301 of drawing 3 ] length. It encodes in the coding section (FEC+Interleave) 208, and this frame 302 serves as the encoded sequence (FEC+Interleaved Sequence) 303. The coding parameter at this time is specified by the transmission-speed control section 204 and the wireless resource Management Department 205. A buffer / separation section 207 once stores the encoded information sequence. Based on the table of the transmission-speed control section 204, subframe division of the data distribution section 206 is carried out for every BS in the information sequence stored in the buffer 207 by the suitable information length shown by 304 of drawing 3 . For example, subframe length is determined as the circuit 111 of BS101 at a rate of K/(K+L+M+N), and is determined as the circuit 112 of BS102 at a rate of L/(K+L+M+N). The frame identifier (ID) and frame attribute (Type) which made the regulation in the case of BS and demultiplexing which are transmitted are added, and a subframe serves as the frame structure 305 of drawing 3 . A subframe is transmitted to BS 101-104 by the distribution section (Data Distribution) 206. At this time, circuit quality information, control information, etc. of a reverse link may be added to a frame 302 and a subframe 305. The data distribution section 206 transmits a subframe to each BS. Each BS which received the subframe is put on a radio frequency, and transmits a subframe to MS105.

[0044] In addition, the transmission-speed control section 204 may manage directly circuit quality information, such as Ec/Io of each forward link collected by the reverse link by MS105, Eb/No, and a frame error rate (henceforth, FER), instead of the wireless resource Management Department 205. In that case, the transmission-speed control section 204 determines the forward link transmission speed for every circuit based on the circuit quality stored in the table, and stores the transmission speed for every circuit in a table similarly while it stores the quality of each circuit in a table. The wireless resource Management Department 205 manages the wireless resource for every BS, and controls not to exceed the transmission capacity beforehand decided for every BS.

[0045] MS105 carries out the reception recovery of the subframe which each BS 101-104 transmits, is reassembled on a frame 303 according to the identifier and attribute of a subframe 305, performs a day interleave and error correcting code-ization, detects a frame 302, reproduces the information sequence 301, and restores the information on original.

[0046] A reverse link completely serves as a reverse procedure. In MS105, error-correcting-code-izing and an interleave are performed for the information sequence to transmit, and it distributes to each wireless port which has a modulation circuit and a RF circuit. This wireless port is equivalent to the wireless interface function of BS of a forward link. As for data distribution of a reverse link, MS opts for distribution based on Eb/No for every BS. On the other hand, when newly setting up a circuit, the monitor of the pilot signal from BS which is going to set up a circuit can be carried out, and transmission speed can be decided by the Ec/Io.

[0047] The data concentrator 201 collects the information on the received reverse link as a format of a subframe 305. Furthermore, the data concentrator 201 extracts control information required for circuit quality control, such as the forward link FER. A buffer / multiplex section 202 once stores a subframe 305 in memory, and assembles it to the encoded sequence 304 according to the identifier and attribute of a subframe 305. the decode section 303 -- a sequence 304 -- a day interleave -- and decode processing is carried out. Finally the check of the quality is performed per frame, and the decoded data are transmitted

to NW107. By the way, the transmission speed of each circuit is not always fixed. The transmission-speed control section 204 recalculates transmission speed again according to change of the circuit quality reported at any time.

[0048] (Example 2)

1. Explain the configuration of BSC more detailed than the structure of a system using drawing 4 . BSC consists of the uphill FER detector + buffer circuit 401, the multiplexing circuit 402, the day interleave circuit 403, a decoder circuit 404, the frame decomposition circuit 405, the output data interface 406, the downstream-transmission-speed control circuit 407, the transmission-speed table 408, the uphill all channel FER monitor circuit 409, the BS-IF circuit 410, the buffer + all transmission-speed control circuit 411, INTARIBA 412, a coding network 413, the frame composition circuit 414, a network and IF415, an interleave, a coding parameter table 417, etc.

[0049] The block diagram of BS is shown in drawing 5 . Two or more receive sections 533-1 - 533-n, and two or more transmitting sections 534-1 - 534-n are contained in BS that it should communicate with two or more terminals. The receive section of BS consists of the received high frequency circuit 501, the complex back-diffusion-of-electrons circuit 502, the rectangular back-diffusion-of-electrons circuit 503, DEINTARIBA 504, a decoder circuit 505, a going-down power control section 507, an Eb/NO monitor circuit 508, a channel FER detector 509, etc. On the other hand, the transmitting section consists of the transmitted RF circuit 510, the complex diffusion circuit 511, the gain control circuit 512, the rectangular diffusion circuit 513, the uphill power control-bit multiplex circuit 514, an interleave circuit 515, a coding network 516, a frame generation circuit 517, etc.

[0050] The terminal configuration of this invention is shown in drawing 6 . Two or more receive sections 633-1 - 633-n, and two or more transmitting sections 634-1 - 634-n are contained in MS105 that it should communicate with two or more BS. The receive section of MS consists of the received high frequency circuit 601, the complex back-diffusion-of-electrons circuit 602, the rectangular back-diffusion-of-electrons circuit 603, DEINTARIBA 604, a decoder circuit 605, going-down Ec/I0 detector 606, an uphill power control section 607, an Eb/NO monitor circuit 608, a FER detector 609, etc. On the other hand, the transmitting section consists of the transmitted RF circuit 610, the complex diffusion circuit 611, the gain control circuit 612, the rectangular diffusion circuit 613, the power control-bit multiplex circuit 614, an interleave circuit 615, a coding network 616, a frame generation circuit 617, etc.

[0051] A control section common to two or more transceiver sections is shown in drawing 7 . The common control section 735 consists of a buffer circuit 718, the multiplexing circuit 719, the day interleave circuit 720, a decoder circuit 721, the frame decomposition circuit 722, data output IF723, the uphill transmission-speed control circuit 724, the going-down link FER monitor circuit 725, the transmission-speed table 740, the distribution circuit 726, a buffer and all the transmission-speed control circuits 727, INTARIBA 728, the decryption circuit 729, the frame generation circuit 730, input data IF731, the wireless resource Management Department 732, an interleave, a coding parameter table 742, etc.

[0052] 2. Explain system behavior, next actuation of a forward link. The frame generation circuit 414 of BSC carries out part division of the input data from a network per frame, and adds a signal still more nearly required for information discernment at a receiving side (630A). A coding network 413 error-correcting-code-izes the output of the frame generation circuit 414. The INTARIBA circuit 412 is interleave-ized by changing informational permutation (628A). The wireless resource Management Department 416 gives the coding parameter and interleave parameter at this time. Then, a buffer / full speed control circuit 411 determines the total transmission speed of the information transmitted from two or more BS. The forward link transmission-speed control circuit 407 computes the transmission speed for every circuit based on Eb/No of each forward link, an Ec/Io value, or FER as well as the frame error rate (henceforth, FER) of all the forward links transmitted by the reverse link. Control of this transmission speed is performed in consideration of the wireless resource usage of all BS that a BSC subordinate has. Then, a signal distributes the BS-IF circuit 410 to each BS correspondence (626A). The BS-IF circuit 410 becomes irregular respectively, and carries out the radio transmission of the signal

(626A) separated for every BS.
[0053] BS equips a forward link with two or more transmitting sections 534-1 - 534-n (n is the two or more natural numbers). The frame generation circuit 517 performs frame-ization so that the wireless interface between BS and MS may be suited (617A). A coding network 516 error-correcting-code-izes the output of a frame generation circuit. The interleave circuit 515 changes that of permutation data for interleave-izing (615A). The reverse link power control-bit multiplex circuit 514 adds power control information to the output of the interleave circuit 515. The rectangular diffusion circuit 513 carries out quadrature modulation of the output of an interleave circuit. The gain control circuit 512 adjusts transmitted power gain. The complex diffusion circuit 511 performs complex diffusion to the information to which transmitted power gain was adjusted. The RF circuit 510 changes the information after complex diffusion into a transmit-frequencies signal, and transmits it to MS.
[0054] Next, the forward link receiving component and function of MS are explained using drawing 6 and 7. Two or more receivers 633-1 - 633-n (n is the two or more natural numbers) are carried in MS105 so that two or more circuits can be received to coincidence. Each receiver operates independently respectively. As for the signal received in the received RF circuit 601, collating of a cel is performed in the complex back-diffusion-of-electrons circuit 602. Then, a channel is identified in the rectangular back-diffusion-of-electrons circuit 603, and an error correction is performed by the day interleave circuit 604 and the decoder circuit 605. The reverse power control circuit 607, the Eb/No monitor circuit 608, and the FER detector 609 are carried in a receiver, and it controls with the monitor for power control.
[0055] In MS common control section 735, the output of each receiver is brought together in a buffer circuit 718. Timing adjustment is performed here and multiplexing of each received data is performed in the multiplexing circuit 719. Since the interleave of the multiplexed data is carried out in the interleave circuit 628 of BSC, they perform actuation of returning permutation in the day interleave circuit 720 of MS common control section 735. Error correction actuation is performed by the after decoder circuit 721. The original data are extracted after that in the frame decomposition circuit 722, and the output data 723 are transmitted to the data-processing section of a terminal equipment. In this process, decoder-circuit 721 output detects FER of all forward links in a forward link FER monitor circuit. This FER information is transmitted to BSC via BS by the reverse link.
[0056] The synthetic example of the frame in the case of receiving by MS is explained. It gets over independently with MS receiver, and each circuit from BS is set to subframe 718A. Quality (QI) is checked while ID and an attribute are read here. The sequence which multiplexes the signal received by two or more circuits according to the array of ID is read. With an attribute, a control signal etc. changes priority and processing is performed. Only the information sequence of subframe 718A is taken out and multiplexed. Since an interleave and FEC are still performed, information 719A after multiplexing cannot be taken out. The permutation of the signal by which the interleave was carried out between circuits is returned first in the day interleave circuit 720. Then, the error correction of the signal FEC(ed) in the decoder circuit is carried out, and frame 721A is reproduced. It is the signal which 722A should receive except for overheads, such as ID.
[0057] Next, a reverse link is explained. The frame generation circuit 730 of MS105 divides the input data from a data terminal device per frame. This frame is error-correcting-code-ized by the coding network 729, and informational permutation is changed in the INTARIBA circuit 728. MS wireless resource Management Department 732 gives the coding parameter and interleave parameter at this time. Then, a buffer / full speed control circuit 727 determines the total transmission speed of the information which should be transmitted to two or more BS. This control is set up by the reverse link transmission-speed control circuit 724 based on Eb/No of each reverse link, or FER as well as the frame error rate of all the reverse links transmitted by the forward link. The wireless resource usage (example: the frequency of a connectable circuit, a sign, time slot) of all BS to which MS can connect this control must be taken into consideration. Then, a signal can distribute to BS correspondence in the distribution circuit 726. A transmitter is assigned to each BS correspondence at one to one.
[0058] Frame-ization is performed in the frame generation circuit 717 so that the wireless interface between MS and BS may be suited with the transmitter of MS. Each transmitter of MS modulates

respectively the signal separated for every BS according to an individual, and is transmitted. In the example of drawing 7 , it error-correcting-code-izes by the coding network 716, permutation is changed in the interleave circuit 715, power control information is added to the data by the reverse link power control-bit multiplex circuit 714, and quadrature modulation is performed in the rectangular diffusion circuit 713, and after transmitted power gain adjustment in the gain control circuit 712, and the modulation by the complex diffusion circuit 711, it is changed into a transmit-frequencies signal in the RF circuit 710, and is transmitted to BS.

[0059] Next, the reverse link receiving component and function of BS and BSC are explained. Two or more receivers 533-1 - 533-n are carried in BS so that two or more circuits can be received to coincidence. Each receiver operates independently respectively. The complex back-diffusion-of-electrons circuit 502 performs the complex back diffusion of electrons in order to take MS sending signal and a synchronization for the signal which the received RF circuit 501 received. Then, the rectangular back-diffusion-of-electrons circuit 503 performs the rectangular back diffusion of electrons for the information after the complex back diffusion of electrons, and identifies a channel. The day interleave circuit 504 and a decoder circuit 505 carry out an error correction to the information after the rectangular back diffusion of electrons. The forward power control circuit 507, the Eb/No monitor circuit 508, and the FER detector 509 are carried in a receiver, and it controls with the monitor for power control.

[0060] In BSC, the output of each BS receiver is brought together in the reverse FER detector + buffer circuit 401. The reverse FER detector + buffer circuit 401 adjusts the timing of received data. The multiplexing circuit 402 multiplexes each received data. The interleave of the multiplexed data is carried out in the interleave circuit 728 of MS common control section 735. Then, the day interleave circuit 403 of BSC performs actuation of returning permutation. The after decoder circuit 404 carries out an error correction. After that, the frame decomposition circuit 622 extracts the original data, and transmits the output data to NW. The reverse link FER monitor circuit 409 detects FER of all reverse links based on the output of a decoder circuit 404. This FER information is transmitted to MS105 via BS by the forward link.

[0061] In above-mentioned explanation, as for the transmitter-receiver of BS and MS, the RF circuit is set up separately, and the circuit between MS and Plurality BS is described on the assumption that it is set up on a different frequency. As long as it is the case where this is applied to TDMA, circuit allocation may be identified by the time slot using the same frequency. Moreover, employment with single frequency is possible for the thing in which a multiple-line setup on one frequency is possible like CDMA by performing interference control of timing reservation etc. in advance of transmission and reception.

[0062] 3. Control approach 3.1 of transmission speed About a forward link, MS105 obtains a circuit with BS with best Eb/No, when Ec/Io of a pilot signal connects with best BS. However, if it exceeds the lower limit from which Eb/No required to maintain the transmission speed which needs Ec/Io for systems operation and circuit quality of the pilot signal which other BS transmits is obtained, the circuit can also communicate by choosing transmission speed appropriately and making it correspond. Although MS has a possibility that may be interfering and transmission speed may fall when it receives from two or more BS to coincidence since CDMA is assumed to the present explanation at this time, transmission speed can be raised by using a circuit (slot) reservation method, for example. However, in order to also take into consideration application at an another side ceremony, such as TDMA, and to go ahead with the talk simply, between each circuit of MS and Plurality BS, interference is suppressed by extent which does not have trouble in systems operation by the frequency or time sharing, and it is assumed that it is that from which a signal is separated enough here.

[0063] The cross connection approach is shown below.

[0064] (1) MS carries out the monitor of two or more pilot signals, and sets up the priority which should be connected by Ec/Io.

[0065] (2) MS makes connection by the access channel to BS1 to connect.

[0066] (3) If connection is completed, MS will report the pilot signal which can connect with BSC106,

and its Ec/Io with data request to receipt via connected BS101. MS105 combines and notifies information, such as classification (example: classification of a control line) of the frequency which can be supported, a sign channel, the transmission speed which can be transmitted and received, and the circuit which can be supported. BSC106 identifies BS by ID of a pilot signal. BS102,103 assumes that connection is still more possible.
[0067] (4) it knows that BSC can connect ID to BS102,103 of a pilot signal -- check whether the wireless resource of BS102,103 can assign MS105.
[0068] (5) The circuit (the frequency, the sign, timing), transmission speed which will be assigned with ID (pilot signal) of BS102,103 if possible It notifies to MS105 by the BS101 course which is making current connection. When impossible, it goes into a waiting state, and the process of (3)-(4) is repeated. It is a time-out by the case.
[0069] (6) MS105 sets up reception of the circuit specified about BS102,103.
[0070] (7) MS105 starts reception by the circuit as which BS101,102,103 was specified.
[0071] (8) BSC106 encodes by choosing the parameter of error-correcting-code-izing or an interleave according to transmission speed, distributes a signal for every BS, and starts transmission.
[0072] (9) MS105 supervises receiving quality at any time. Monitor parameters are each Eb/No of BS101,102,103, FER, and FER after multiplex. These values are the time intervals defined beforehand, and are reported to BSC using the control channel of dedication. Moreover, the monitor of Ec/Io is carried out, and also when BS in which new connection is possible appears, it reports to BSC.
[0073] (10) BSC106 adjusts transmission speed, carrying out the monitor of (9). Circuit quality is reported by Eb/No or FER. Transmission speed is lowered when the channel quality of Specification BS deteriorates. Conversely, transmission speed is gathered when it has improved. Priority of the FER quality after multiplex is made the highest.
[0074] (11) When a specific circuit cannot maintain the quality specified even if it lowered transmission speed to the minimum, make the circuit into ** and continue a communication link by the remaining circuits.
[0075] (12) A hand off does not carry out. They are only a line connection and **.
[0076] 3.2 The cross connection approach is shown below about a reverse link.
[0077] (1) MS carries out the monitor of two or more pilot signals, and sets up the priority which should be connected by Ec/Io.
[0078] (2) MS makes connection by the access channel to BS101 to connect.
[0079] (3) If connection is completed, MS105 will report the pilot signal and Ec/Io of Ec/Io to BSC106 with a data Request to Send via connected BS101. BSC106 identifies BS by the pilot wave.
[0080] (4) BSC106 prepares connection of ID to BS102,103 of a pilot signal. It checks whether the wireless resource of BS102,103 can assign MS105.
[0081] (5) The circuit (the frequency, the sign, transmit timing), transmission speed which will be assigned with ID (pilot signal) of BS102,103 if possible It notifies to MS105 via BS101 which is making current connection. When impossible, it goes into a waiting state, and the process of (3)-(4) is repeated. It is a time-out by the case.
[0082] (6) MS105 sets up transmission by the circuit as which BS102,103 was specified.
[0083] (7) MS105 starts transmission by the circuit as which BS101,102,103 was specified.
[0084] (8) MS105 encodes by choosing the parameter of error-correcting-code-izing or an interleave according to the specified transmission speed, distributes a signal for every BS, and starts transmission.
[0085] (9) BSC106 supervises receiving quality at any time. Monitor parameters are Eb/No of the signal received in each of BS101,102,103, FER, and FER after BSC multiplex. These values are the time intervals defined beforehand, and are reported to MS105 using the control channel of dedication. Moreover, MS105 is carrying out the monitor of Ec/Io, and when BS in which new connection is possible appears, it reports it to BSC106.
[0086] (10) MS105 adjusts transmission speed, carrying out the monitor of (9). Circuit quality is reported by Eb/No or FER. Transmission speed is lowered when circuit quality with Specification BS deteriorates. Conversely, transmission speed is gathered when it has improved. Priority of the FER

quality after multiplex is made the highest.
[0087] (11) When a specific circuit cannot maintain the quality specified even if it lowered transmission speed to the minimum, make the circuit into ** and continue a communication link by the remaining circuits.
[0088] (12) A hand off does not carry out. They are only a line connection and **.
[0089] 4. The transmission speed of the setting approach circuit unit of transmission speed can be set up by a desired signal and a desired interference noise power ratio, and shows an example of the correspondence to drawing 8 (a). This correspondence table is stored in the store circuit of a downstream-transmission-speed control circuit (407 or 724). The transmission speed used as criteria is determined now, and also changes transmission speed corresponding to fluctuation of circuit quality. Moreover, since actual circuit quality was estimated by FER in many cases, it was also appended to drawing 8 (a). Selection of a circuit quality parameter (example: FER, Ec/Io, Eb/No) may be changed by the time of a message etc. at the time of cross connection.
[0090] The transmission speed after multiplexing is given by total of the transmission speed of an usable circuit. However, it is necessary to take into consideration interference between this usable circuit at this time. That is, since interference is mutually produced between circuits when using the same frequency and the same time slot, a different interference from Eb/No currently guessed at the time of Ec/Io measurement is measured, and circuit quality may be satisfied by degradation of FER. for this reason -- drawing 8 (b) -- interference -- allowances -- the margin is prepared. Between the channels using the same frequency or the same time slot, interference allowances are given using this successive diminution multiplier. This correspondence table is stored in the store circuit of a downstream-transmission-speed control circuit (407 or 724).
[0091] Even after dividing information into a circuit, the interleave between the circuits by the interleave circuits 412 or 728 needs to set up the interleave size so that degradation of the burst error by phasing etc. may be oppressed enough. Therefore, this size is adjusted according to the transmission-speed ratio between the number of circuit to separate and a circuit. The example of a table is shown in drawing 8 (c). Moreover, in order to raise circuit quality by coding gain, the parameter (example: restricted length, rate of coding) of a coding method may be adjusted. The parameter of an interleave and a coding method is the wireless resource Management Department (407 or 732). It is stored in the store circuit.
[0092] 5. Tail Bit for ID from which input data 631A divided into the distribution approach frame length of data which transmits discriminates a frame, an attribute, a quality index (QI), and FEC is added (630A). After redundancy is added to this frame by FEC, it is set to interleaved sequence 628A. Sequence 628A is divided into two or more sequences according to the transmission speed as which the above-mentioned was determined. Quality indexes, such as sequence of a sequence, ID which gives the address, an attribute which gives data classification information, and CRC, are given to each information sequence, and it becomes the subframe of 626A, and is transmitted to BS from BSC. The decision of the distribution place which distributes the information sequence of 627A to BS is controlled so that each circuit quality of transmission speed, and BS and MS which is performed as a smallest unit and shows the period which checks circuit quality to drawing 8 corresponds.
[0093] When, as for a certain circuit, transmission speed falls with fluctuation of circuit quality, data may be in the state waiting for transmitting in a buffer circuit 411. In this case, when other circuits have allowances in transmission speed to that permission transmission speed, data are changed to other circuits, without considering as a transmitting waiting state.
[0094] Transmission speed in case the circuit is set as drawing 9 between MS and three BS, and the example of allocation of a signal are shown. In this drawing, at the time of the highest transmission speed per circuit, it shall time-amount-interval(tn and time interval of tn-+-1 )-hit, and four data blocks shall be transmitted about the data block which evaluates circuit quality and which carried out the interleave. In the minimum transmission speed, one data block per time amount interval shall be transmitted. This transmission speed is determined by the circuit quality evaluation parameter shown in drawing 8 , such as Ec/Io, Eb/No, and FER. If its attention is paid to CH1, since all have circuit quality in a record level during time of day t1-t5 as for CH1, transmission speed will also serve as max. On the

other hand, in CH2, between time of day t1 - t5, since communication link quality has deteriorated in proportion to time amount, transmission speed also deteriorates in proportion to it. Furthermore, between time of day t1 - t2, since circuit quality is the minimum, only one data block can send CH3. However, since circuit quality improved at time of day t3, it is possible to send 3 data slot.
[0095] Allocation of the transmit data after an interleave gives priority to and distributes what has good circuit quality, and transmits it previously. This is for being the conditions according to an early and propagation environment, and transmitting as many signals as possible as much as possible, after circuit quality data (Eb/No, Ec/Io, FER) reception.
[0096] (Example 3) MS105 carries out call origination and the example of operation in the case of setting up two or more circuits is explained using drawing 10 . If MS call request is judged (1000), MS105 will transmit a call request (1001). In this case, the channel which transmits a call request is used. This is henceforth called an access channel. MS105 performs a call request to BS by which registration is made using an access channel. However, this access channel is ability ready for receiving in two or more BS, and this may be used, as long as composition of the access channel input signal from two or more BS is possible in BSC106 like other traffic channels and it is.
[0097] A traffic channel is set up between MS105 and BS101, and it is assumed that communication service was started (1002-1011). The case where the information which runs short of capacity only by the circuit with BS101 and to upload is in MS105 is assumed. MS105 requires the high-speed transport service by multi-BS transmission from BS (1040). At this time, MS105 transmits the pilot signal and the list of statistics on the strength (example: Ec/Io) of BS of the level beyond a certain threshold which MS105 has received to BSC106 (1022). Based on the received list information, BSC106 looks for BS which may be able to communicate with MS105, and it investigates whether assignment of a wireless resource is possible (1023). If BS102 is judged that a communication link is possible by BSC106 here, BSC106 will apply the activate request of a circuit to MS105 to BS102 (1024-1025). At this time, BSC106 permits cross connection with BS102 to MS105 by the hand-over activate request via BS101 (1026-1027). A circuit is newly set up by the same approach as MS105 and BS102, i.e., the conventional hand-over, and, as for MS105, a communication link becomes possible via BS101 and BS102 (1028-1030). While distributing and transmitting MS105 to the rate which was adapted for each circuit quality after it error-correcting-code-izes information to transmit and carries out an interleave if a communication link is started between BS101 and BS102 with MS105, BSC106 multiplexes the signal received by BS101,102, and day interleave ** decodes it, and it reproduces a signal sequence (1031-1032). Although it is also the same as that of the above when the number of BS is three or more, the places where a hand-over message becomes two or more differ.
[0098] In the above, although it is dependent on the received signal power and circuit quality between MS and BS when BS connected previously makes connection **, this mentions later. A BS/BSC side carries out call origination, termination is carried out by MS, and the example in the case of setting up two or more circuits is explained using drawing 11 .
[0099] BSC106 will transmit a paging message (Page Message) from BS into which MS105 is registered, if the paging demand of MS105 is received from a network (1100) (1101). By MS receiving and compounding the paging message from two or more BS at this time, as long as a recovery is possible, that approach may be used. The communication procedure of MS and BS101 into which it is registered is the same as the conventional approach (1102-1112). If communication service is started (1113) and there is a demand of the high-speed data service using multi-BS from the BSC side (1130), BSC106 will transmit a demand message via BS101 (1114). At this time, BSC106 may carry out the monitor of the signal of this MS105 to two or more BS beforehand, and may transmit BS which can serve as a candidate of connection with the message of the first half. MS105 transmits the pilot signal of the signal power beyond a certain fixed threshold, and its list to BSC by BS1 course to the above-mentioned message (1115). Based on the list information on MS105, BSC106 determines BS which serves as a candidate, and assigns a wireless resource. The radio channel of BS102 shall be assigned (1116-1118). BS101 transmits the hand-over start up message to BS102 to MS105 (1119). MS105 carries out setting initiation of the circuit with BS102, with a circuit with BS101 held (1120). MS105

sets up a circuit with BS102 by the same approach as the conventional hand-over (1121-1123).
[0100] If a circuit will be set MS105 as BS101,102 and coincidence, BSC106 will error-correcting-code-ize information which should be transmitted, and will distribute it to each of BS101,102 with the transmission speed corresponding to circuit quality after an interleave. BS101,102 is transmitted by coding and a cel (sector) signal setup which are set up independently, respectively. In MS105, after restoring to the signal from BS101,102 as an input-signal sequence which became independent respectively, it multiplexes, and decodes after a day interleave and an information sequence is reproduced (1124-1125). Although it is also the same as that of the above-mentioned when the number of BS is three or more, the places where a hand-over message becomes two or more differ.
[0101] (Example 4) The outline of the approach of hand-over is explained using drawing 12 . The succeedingly detailed example of a sequence is explained using drawing 13 . In drawing 12 , BS 101-104 has each service area, and each service area is overlapped partially as mentioned above. The case where MS105 which is present in the area of BS101 moves to the area of BS104 is considered. In drawing 12 (a), since MS105 is in the field which can obtain service only from BS101, it has not connected the circuit in other BS 102-104. In drawing 12 (b), MS105 is moving to the boundary of the area of BS101 and BS103. MS105 set up both BS and circuits, and has transmitted and received information which is different with the transmission speed corresponding to Eb/No of each circuit. At drawing 12 (c), MS105 is BS101,103,104. It is in a cel field and these three BS and circuits are set up. However, it is outside the cel range of BS102. MS105 can obtain BS103 and best Eb/No, and is communicating with a high transmission speed. Since the circuit with BS101 has bad circuit quality, it has a low speed. Drawing 12 (d) is the example which MS105 moved to the field in which all BS and connection of BS 101-104 are possible. Also in this case, four circuits have transmitted a different information sequence with the transmission speed according to interference conditions.
[0102] Next, concrete actuation of hand-over is explained using drawing 13 . It is assumed that MS105 is connected to both BS101 and BS102 (1300). MS105 is controlling transmission speed according to an interference condition, performing power control with two BS. Moreover, at least one of two or more circuits shall be set to high priority, and the priority of transmission and reception shall be granted. This ranking specifies the priority of the reservation approach of a circuit, the importance of a signal to transmit. Here, it is assumed that a high priority is first given to BS101 and a communication link is continued (1301 1302).
[0103] Release of the circuit under connection by hand-over is performed by the same procedure as the hard hand-over which delivers a circuit between the systems by which the conventional frequencies differ. However, transmission and reception of a control signal are performed only using the high circuit of a priority.
[0104] If there are some which have the conditions of the high circuit of priority in others when the signal strength becomes low and is less than a threshold (1303), although the signal from BS101 is in high priority (1304), a high priority will be changed to BS102 at least 1 of them, and here. MS reports the candidate list of new BS while notifying modification of BS priority to BSC (1305) (1306). The actuation in the case of newly connecting BS is almost the same as actuation of drawing 10 . If Ec/Io from BS101 deteriorates rather than a threshold, while MS105 directs to lower transmission speed to BS101, the transmission speed from MS105 is also lowered (1309).
[0105] If Ec/Io deteriorates below in a threshold with difficult maintenance of a circuit with BS101 (1308), MS105 will report the list of new BS to BSC106 (1309), it will notify releasing the circuit of BS101 (1310), and the communication link with BS101 will be ended (1312). BSC106 releases the wireless resource of BS101 (1313). The circuit only with BS2 is maintained in this example (1314).

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the communication system configuration of this invention.
[Drawing 2] It is drawing showing the communication system configuration of this invention.
[Drawing 3] It is drawing showing the frame structure of this invention.
[Drawing 4] It is drawing showing the example of a configuration of the base station control station of this invention.
[Drawing 5] It is drawing showing the example of a configuration of the base station of this invention.
[Drawing 6] It is drawing showing the example of a configuration of the terminal of this invention.
[Drawing 7] It is drawing showing the example of a configuration of the terminal of this invention.
[Drawing 8] It is drawing showing the example of a parameter of this invention.
[Drawing 9] It is drawing showing the related example of circuit quality and circuit transmission speed.
[Drawing 10] It is drawing showing the example of a cross connection sequence at the time of MS call origination.
[Drawing 11] It is drawing showing the example of a cross connection sequence at the time of MS termination.
[Drawing 12] It is drawing showing the example of a communication link at the time of terminal migration.
[Drawing 13] It is drawing showing the example of a control sequence at the time of terminal migration.

[Description of Notations]
101-104 -- BS 1-4 (base station 1-4),
105 -- MS (wireless terminal),
106 -- BSC (base station controller),
107 -- Network,
301 -- Data collection section (Data Concentration),
302 -- A buffer / multiplex section,
303 -- Decode section,
304 -- Transmission-speed control section,
305 -- Wireless resource Management Department,
306 -- Distribution section,
307 -- A buffer / separation section,
308 -- Coding section.

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DRAWINGS

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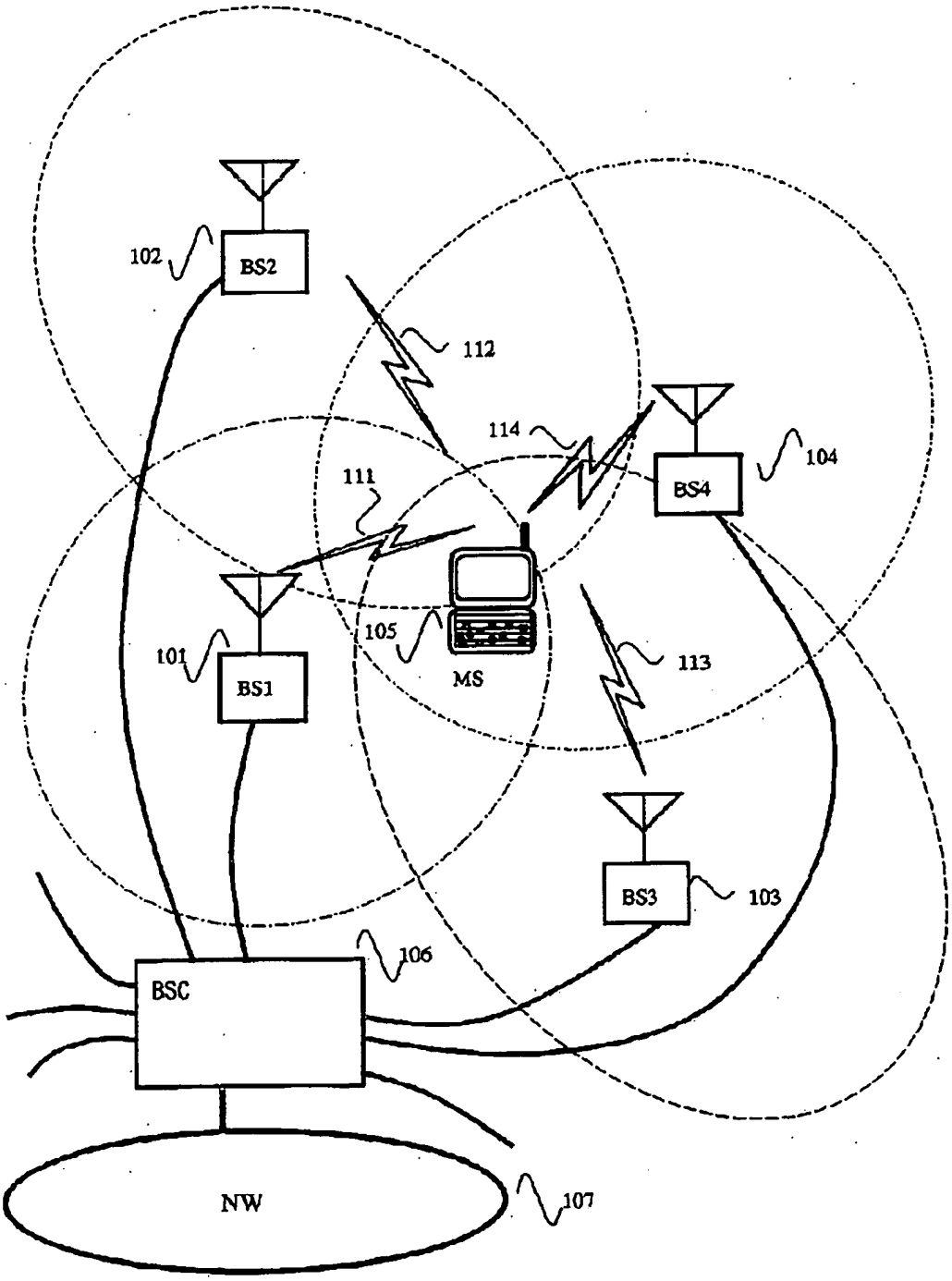
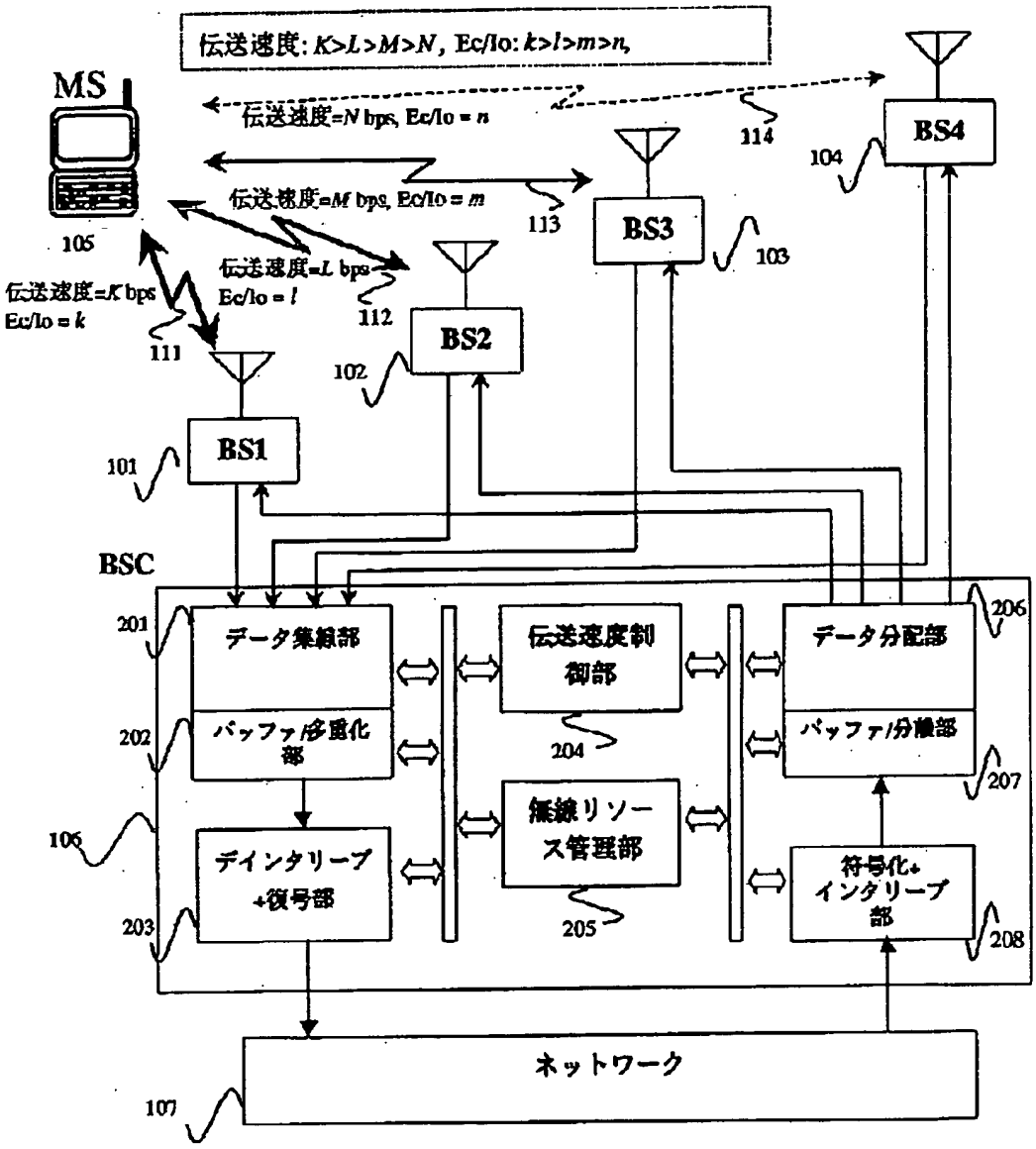
[Drawing 1]

図 1


102
BS2
112
114
104
BS4
111
105
MS
101
BS1
113
BS3
103
106
BSC
NW
107

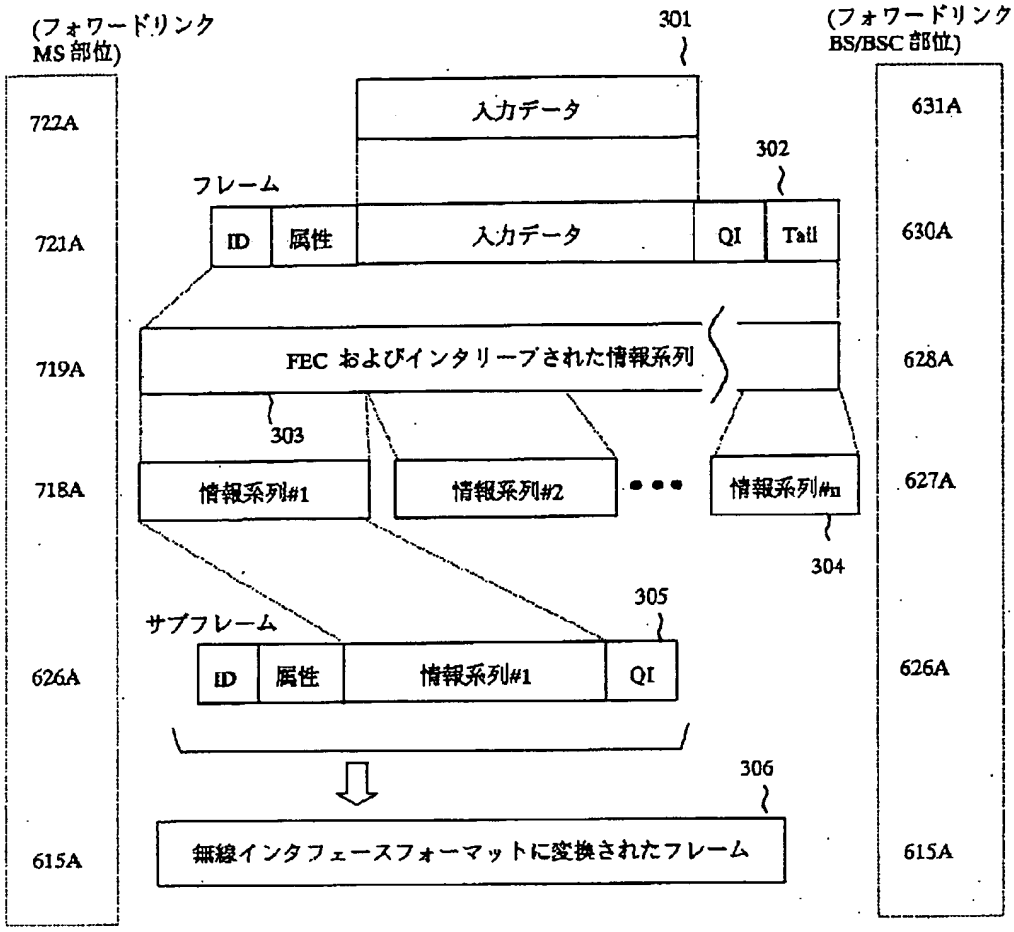
[Drawing 2]

図 2


伝送速度: K>L>M>N, Ec/Io: k>l>m>n,
MS
伝送速度=N bps, Ec/Io = n
114
BS4
104
伝送速度=M bps, Ec/Io = m
113
BS3
103
105
伝送速度=L bps
Ec/Io = l
112
伝送速度=K bps
Ec/Io = k
111
BS2
102
BS1
101
BSC
201
データ集線部
伝送速度制御部
データ分配部
206
202
バッファ/多重化部
204
バッファ/分離部
207
106
デインタリーブ+復号部
無線リソース管理部
符号化+インタリーブ部
203
205
208
ネットワーク
107

[Drawing 3]

図 3

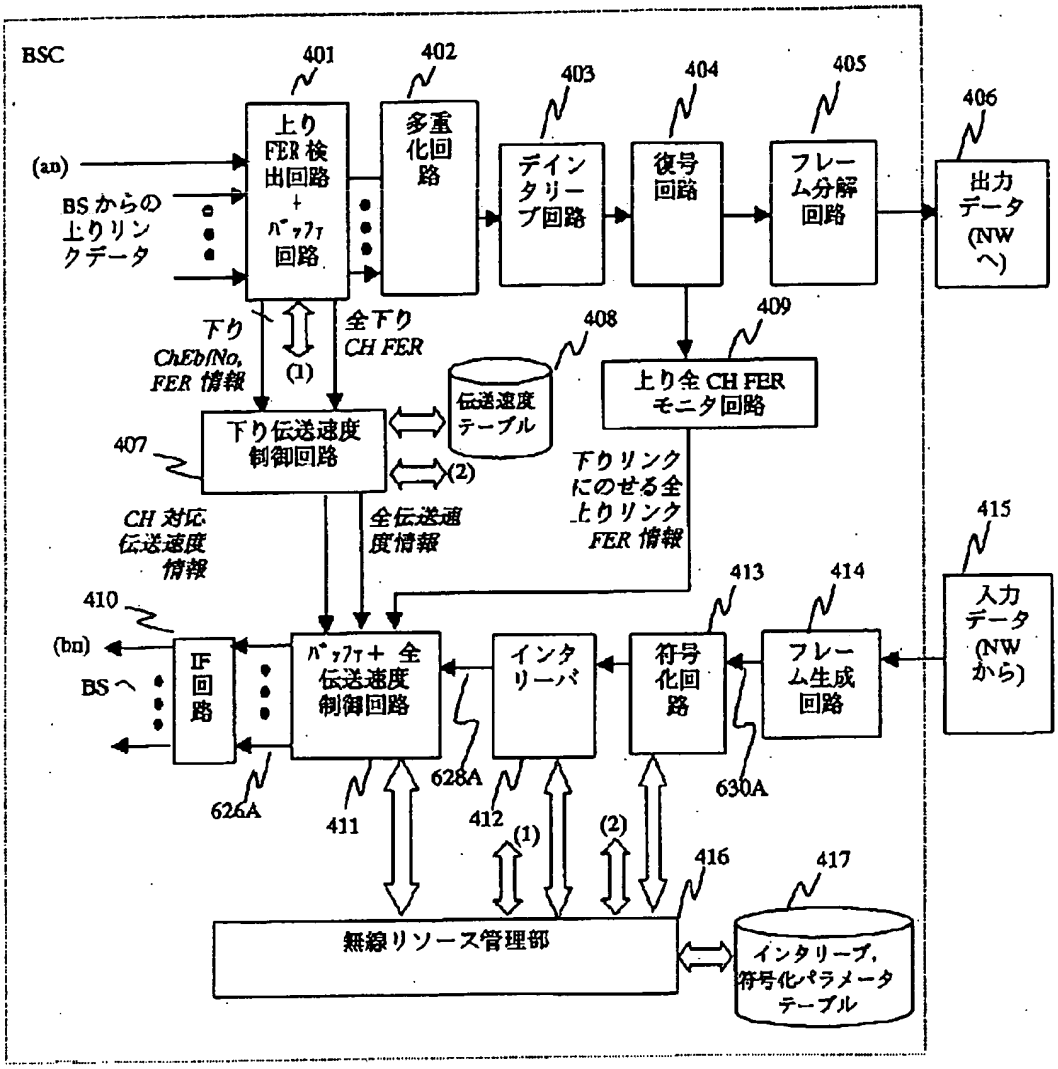



Note:

- QI =品質指標( Quality Information)
- FEC=誤り訂正符号化(Forward Error Correction)
- Tail=FEC 用付加ビット
- ID=識別子(IDentifier)

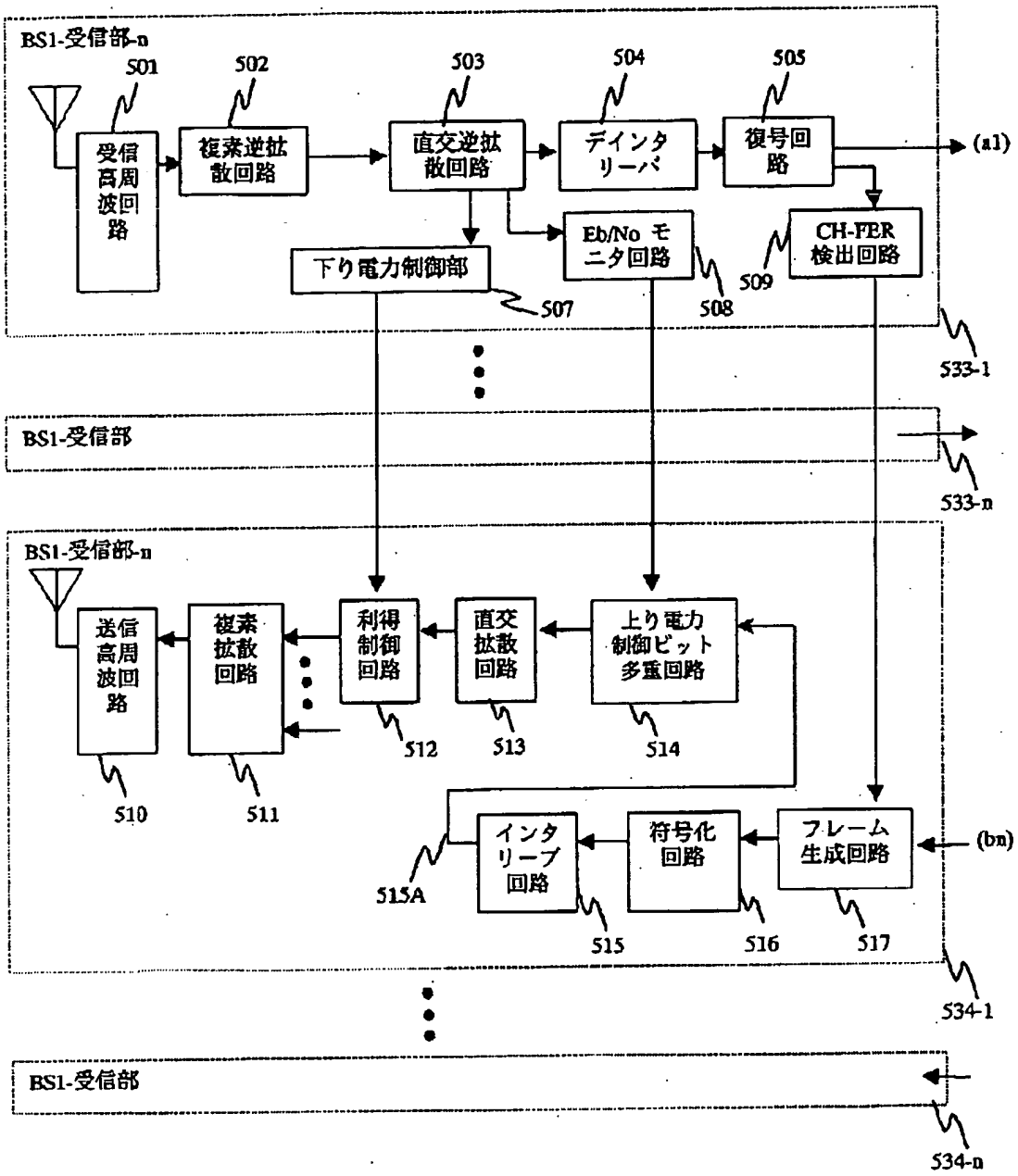
[Drawing 4]

図 4


BSC
401
402
403
404
405
406
上り FER 検出回路 + バッファ 回路
多重化回路
デインタリーブ回路
復号回路
フレーム分解回路
出力データ (NW へ)
(an)
BS からの上りリンクデータ
下り CIEb/No, FER 情報
(1)
全下り CH FER
408
409
伝送速度テーブル
上り全 CH FER モニタ回路
407
下り伝送速度制御回路
(2)
下りリンクにのせる全上りリンク FER 情報
CH 対応伝送速度情報
全伝送速度情報
415
413
414
410
入力データ (NW から)
(bn)
BS へ
IF 回路
バッファ + 全伝送速度制御回路
インタリーバ
符号化回路
フレーム生成回路
626A
628A
630A
411
412
(1)
(2)
416
417
無線リソース管理部
インタリーブ, 符号化パラメータテーブル

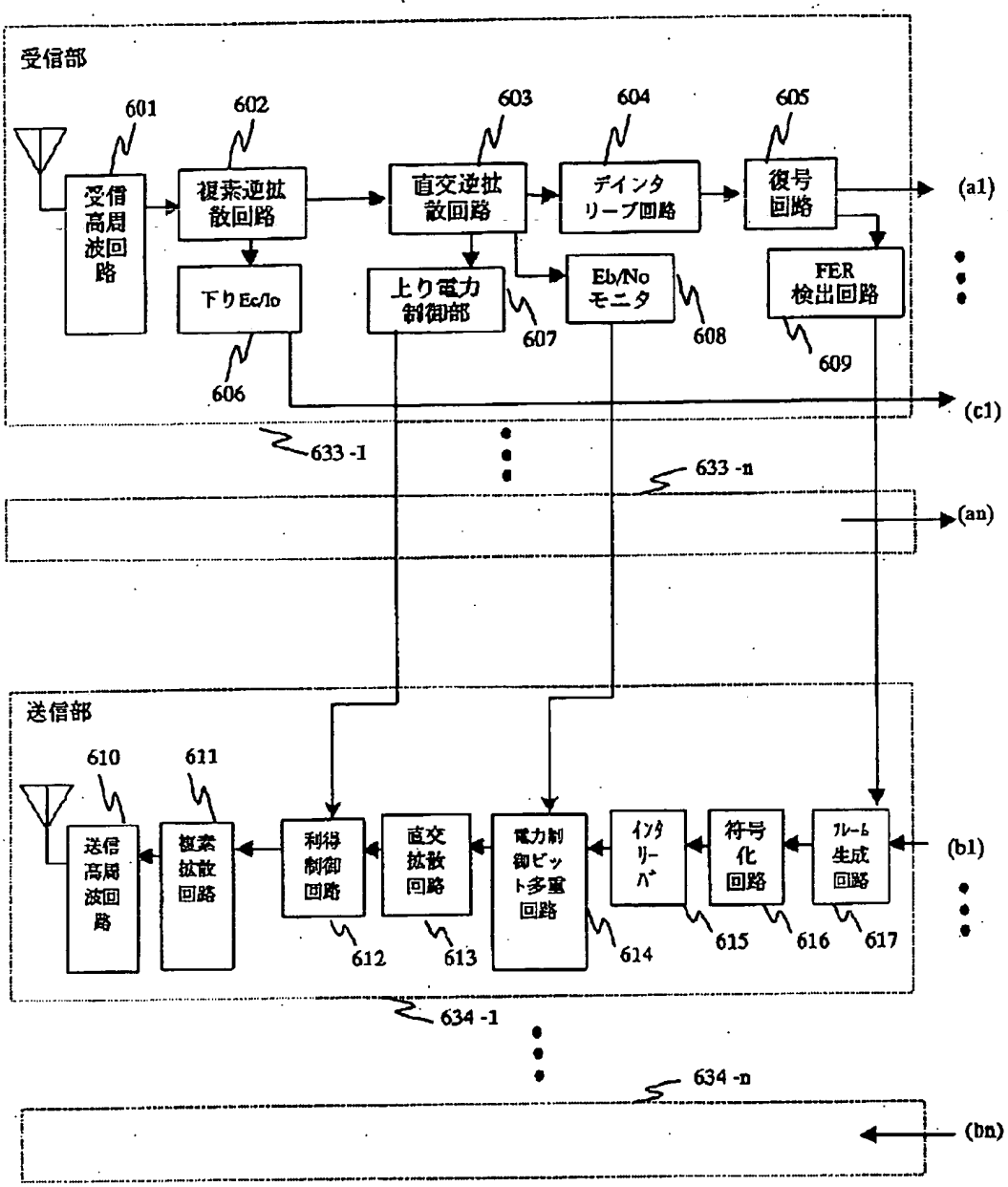
[Drawing 5]

図 5


BS1-受信部-n
501
502
503
504
505
受信高周波回路
複素逆拡散回路
直交逆拡散回路
デインタリーバ
復号回路
(a1)
Eb/No モニタ回路
CH-FER 検出回路
下り電力制御部
507
508
509
533-1
BS1-受信部
533-n
BS1-受信部-n
送信高周波回路
複素拡散回路
利得制御回路
直交拡散回路
上り電力制御ビット多重回路
510
511
512
513
514
インタリーブ回路
符号化回路
フレーム生成回路
(bn)
515A
515
516
517
534-1
BS1-受信部
534-n

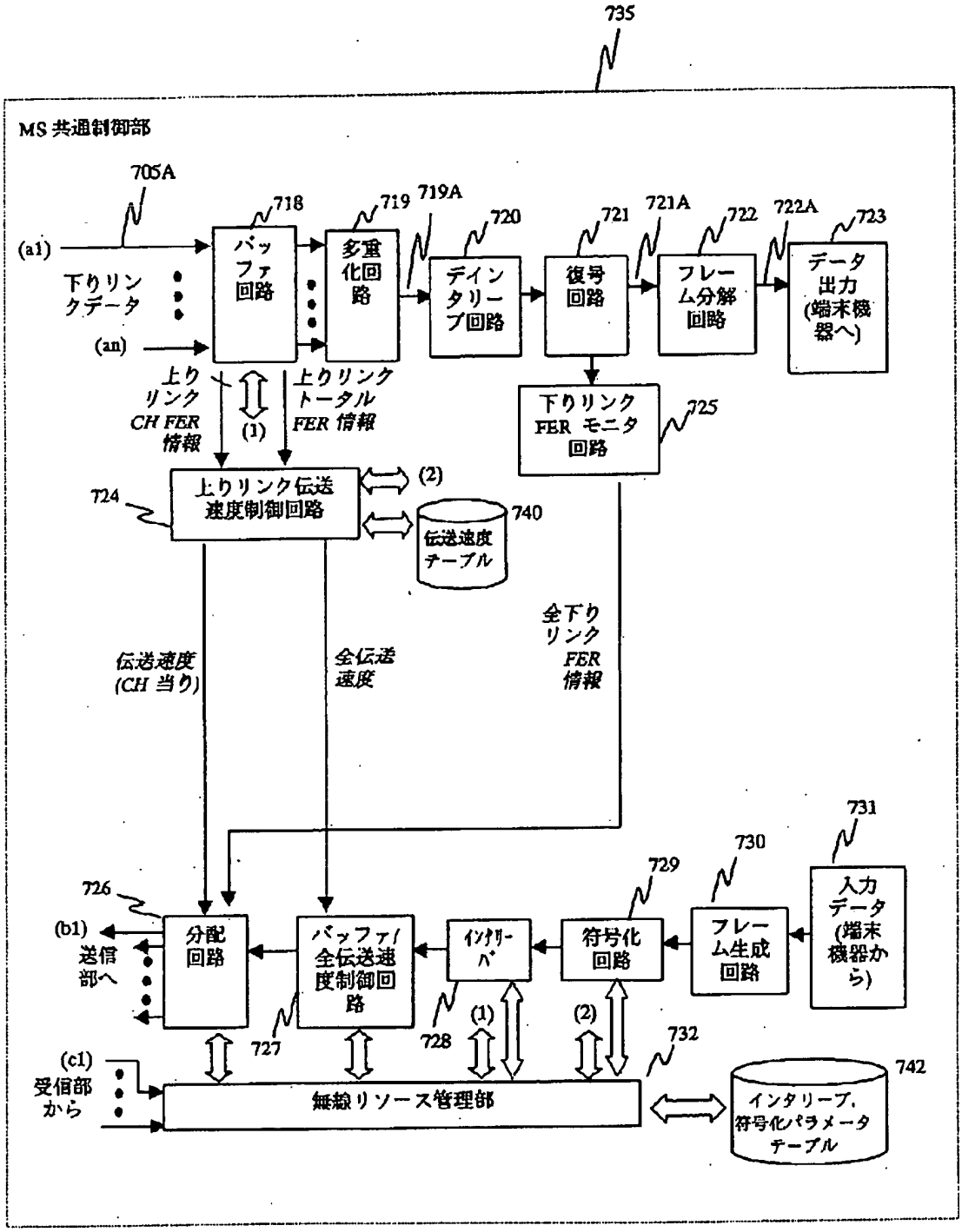
[Drawing 6]

図 6


受信部
601
602
603
604
605
受信高周波回路
複素逆拡散回路
直交逆拡散回路
デインタリーブ回路
復号回路
(a1)
下りEc/Io
上り電力制御部
Eb/Noモニタ
FER検出回路
606
607
608
609
(c1)
633 -1
633 -n
(an)
送信部
610
611
送信高周波回路
複素拡散回路
利得制御回路
直交拡散回路
電力制御ビット多重回路
インタリーバ
符号化回路
フレーム生成回路
(b1)
612
613
614
615
616
617
634 -1
634 -n
(bn)

[Drawing 7]

図 7


735
MS 共通制御部
705A
(a1)
下りリンクデータ
(an)
718
バッファ回路
719
多重化回路
719A
720
デインタリーブ回路
721
復号回路
721A
722
フレーム分解回路
722A
723
データ出力(端末機器へ)
上りリンク CH FER 情報
(1)
上りリンクトータル FER 情報
下りリンク FER モニタ回路
725
724
上りリンク伝送速度制御回路
(2)
740
伝送速度テーブル
伝送速度 (CH 当り)
全伝送速度
全下りリンク FER 情報
731
730
729
726
(b1)
送信部へ
分配回路
バッファ/全伝送速度制御回路
インタリーバ
符号化回路
フレーム生成回路
入力データ(端末機器から)
727
728
(1)
(2)
732
742
(c1)
受信部から
無線リソース管理部
インタリーブ,符号化パラメータテーブル

[Drawing 8]

図8

(a)回線単位の伝送速度パラメータ

| | | | | | |
|---|---|---|---|---|---|
| 最低Ec/Io | *s* | *t* | ---- | *v* | *w* |
| 最低Eb/No | *k* | *l* | ---- | *m* | *n* |
| CH当りの許容最大伝送速度 | *K* | *L* | ---- | *M* | *N* |
| 回線ごとのFER | 各回線の品質の評価に使用する。たとえばFERが基準値を下回る場合には伝送速度を下げる。 | | | | |

(b)多重化後の全伝送速度パラメータ

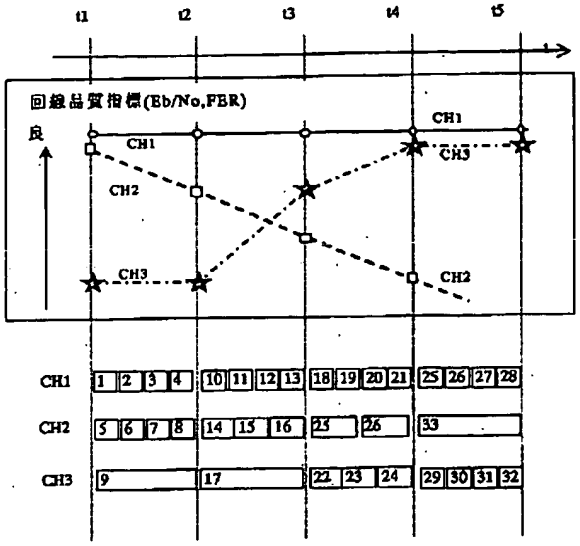
| | | | | | |
|---|---|---|---|---|---|
| 回線ごとの推定伝送速度総和 | *a* | *b* | | *c* | *d* |
| 干渉余裕係数 | 同一の周波数やタイムスロットを回線間で許容する場合に、特定の回線に適用する。回線予約方式やシステムの干渉余裕度に依存する。 | | | | |
| 許容最大伝送速度(多重化後) | *W* | *X* | ---- | *Y* | *Z* |
| 多重化後のFER | 各回線を多重化した後の品質の評価に使用する。たとえばFERが基準値を下回る場合には伝送速度を下げる。 | | | | |

(c)多重化信号のインタリーブサイズパラメータ

| | | | | | |
|---|---|---|---|---|---|
| 接続回線数 | *a* | *b* | | *c* | *d* |
| 回線間の伝送速度比 | *p* | *q* | | *r* | *s* |
| インタリーブサイズ(インタリーブするフレーム数) | *s* | *t* | ---- | *v* | *w* |

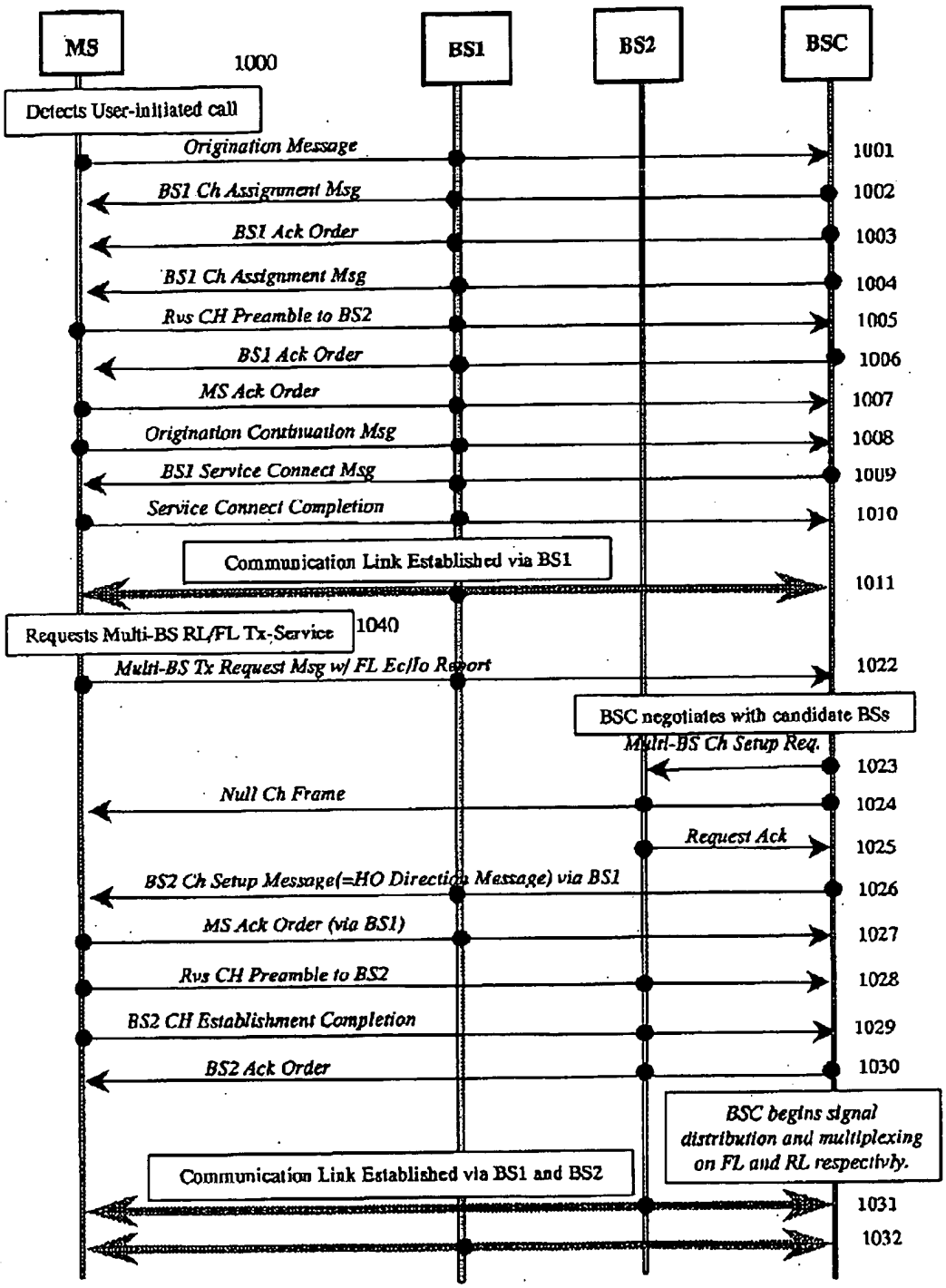
[Drawing 9]

図9



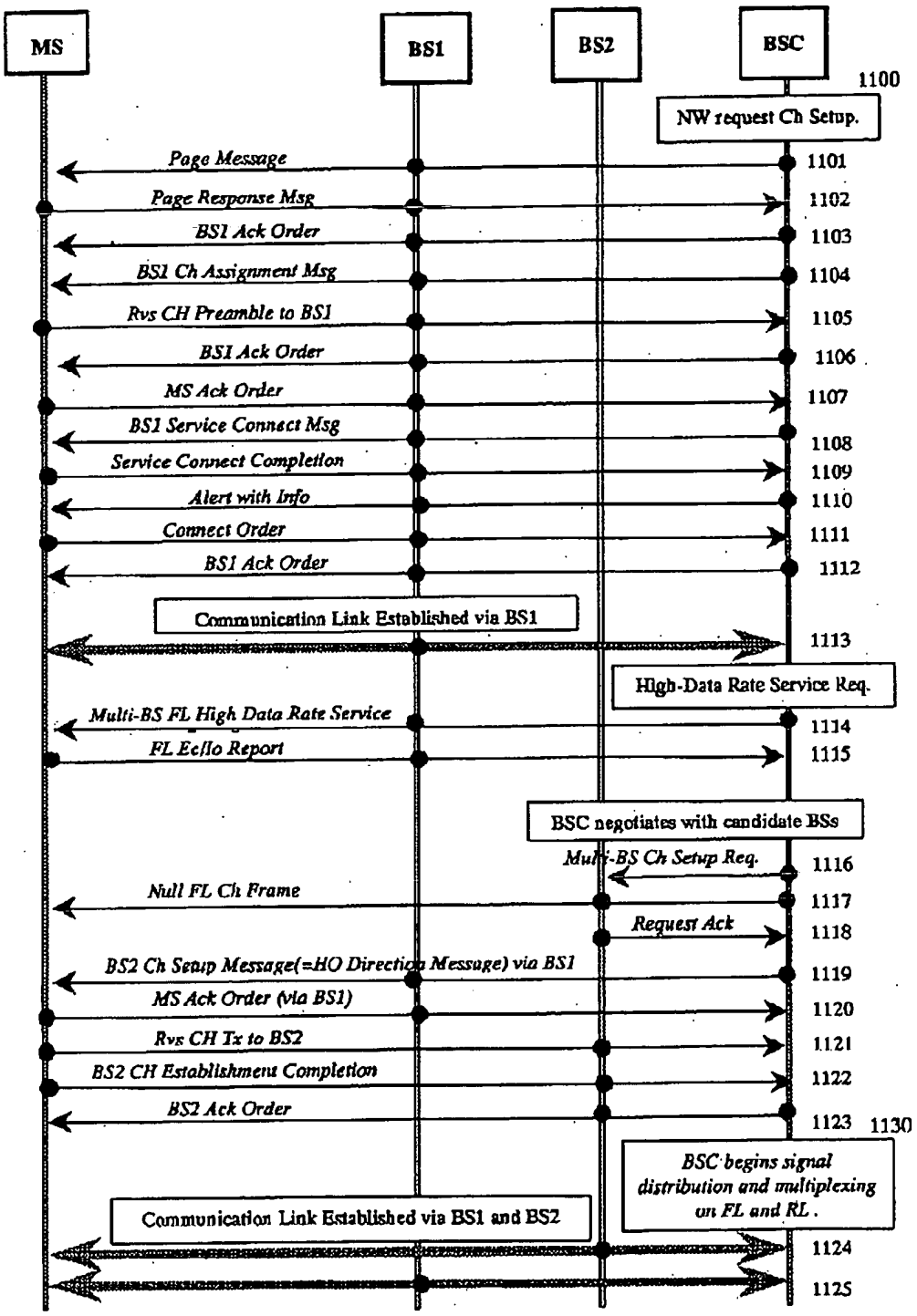

[Drawing 10]

図 10



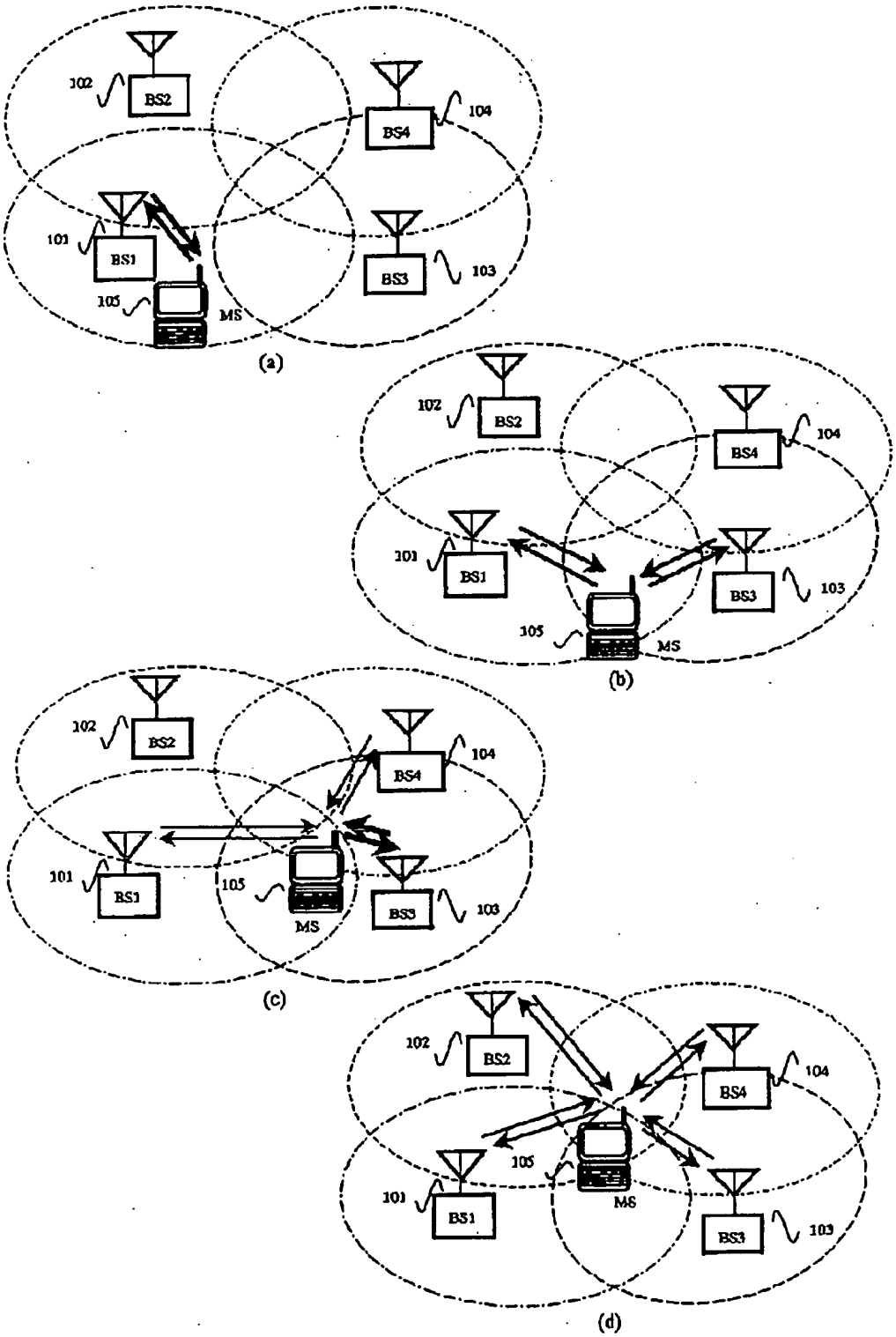

[Drawing 11]

図 11



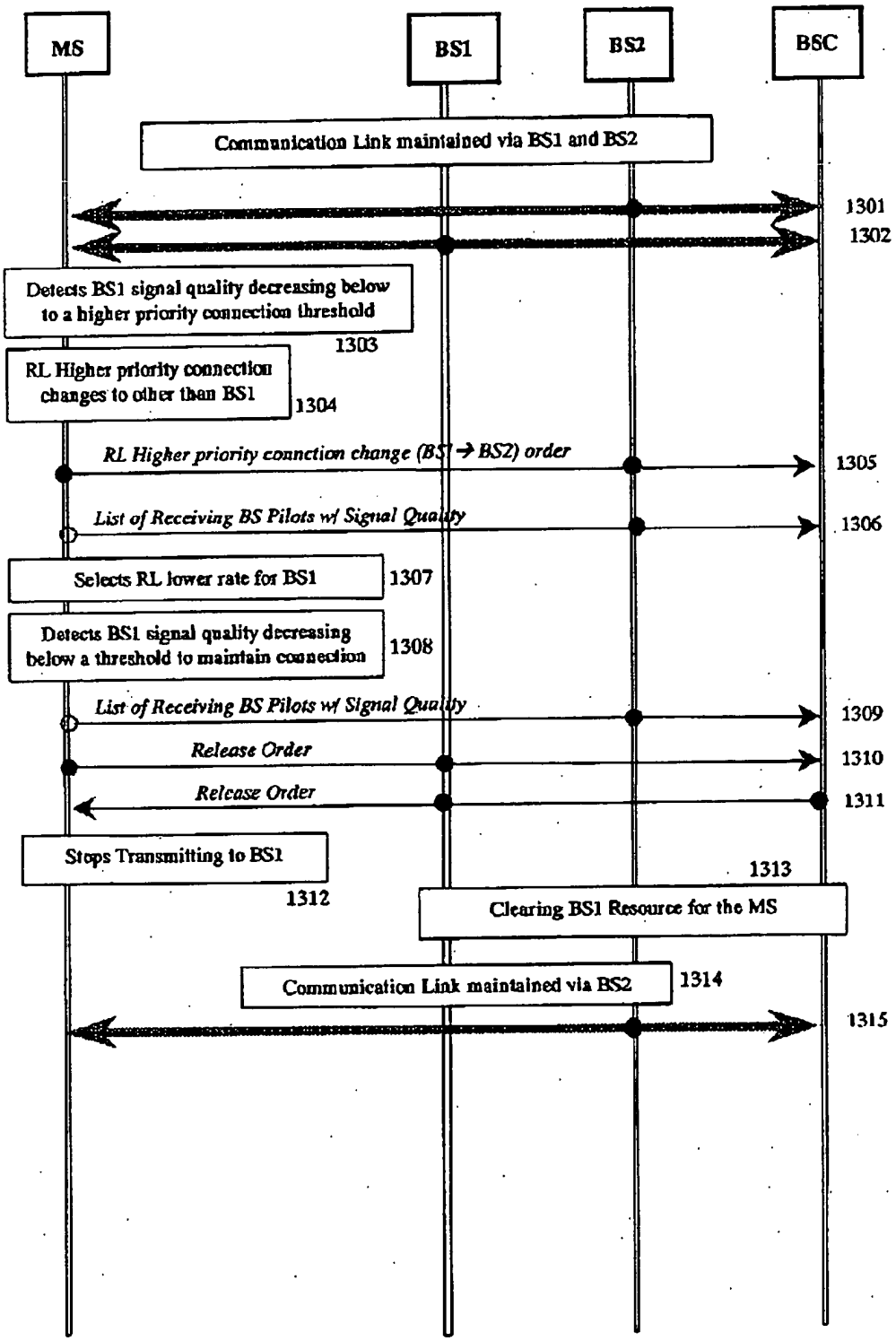

[Drawing 12]

図 12




[Drawing 13]

図 13

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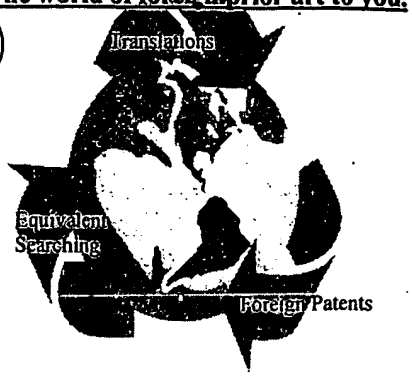


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# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-036964
(43)Date of publication of application : 09.02.2001

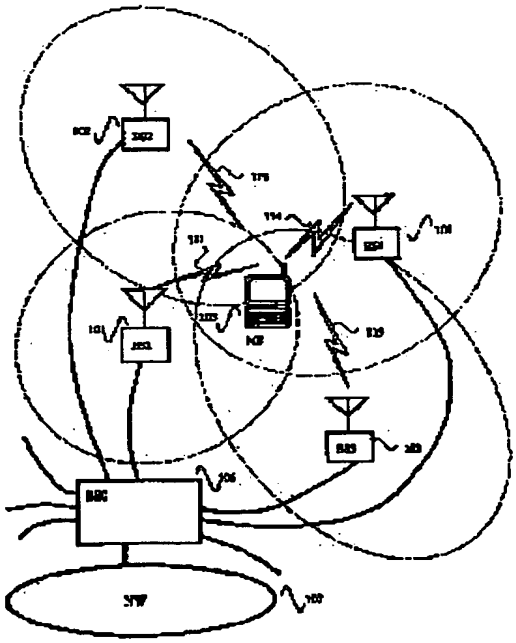
(51)Int.Cl. H04Q 7/38
H04B 7/26
H04J 13/00
H04L 1/00

(21)Application number : 11-205772
(22)Date of filing : 21.07.1999

(71)Applicant : HITACHI LTD
(72)Inventor : ISHIDA KAZUTO
MAZAWA SHIRO
SHIMOGAMA KIYOHIRO
KUROKAWA TOSHIAKI
YAMAGUCHI TSUTOMU

## (54) COMMUNICATION SYSTEM AND ITS METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To attain high speed transmission and the valid use of a radio resource in a radio communication system.
SOLUTION: In this communication system constituted of a radio terminal 105 and plural radio base stations 101-104 for communicating through a communication line with the radio terminal, a communication line to be used for communication is selected based on the communication line qualities 111-114, and communication information is divided for each selected communication line, and the divided communication information is communicated through the selected communication line so that high speed transmission can be realized.



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[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision

of rejection]
[Date of requesting appeal against examiner's decision of rejection]
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(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号
特開2001－36964
（P2001－36964A）
(43)公開日　平成13年２月９日(2001.2.9)

| (51)Int.Cl.' | 識別記号 | ＦＩ | | テーマコード'（参考） |
|---|---|---|---|---|
| Ｈ０４Ｑ　7/38 | | Ｈ０４Ｂ　7/26 | １０９Ａ | ５Ｋ０１４ |
| Ｈ０４Ｂ　7/26 | | Ｈ０４Ｌ　1/00 | Ａ | ５Ｋ０２２ |
| Ｈ０４Ｊ　13/00 | | Ｈ０４Ｂ　7/26 | Ｐ | ５Ｋ０６７ |
| Ｈ０４Ｌ　1/00 | | Ｈ０４Ｊ　13/00 | Ａ | |

審査請求　未請求　請求項の数15　ＯＬ　（全 26 頁）

(21)出願番号　特願平11－205772

(22)出願日　平成11年７月21日(1999.7.21)

(71)出願人　000005108
株式会社日立製作所
東京都千代田区神田駿河台四丁目６番地
(72)発明者　石田　和人
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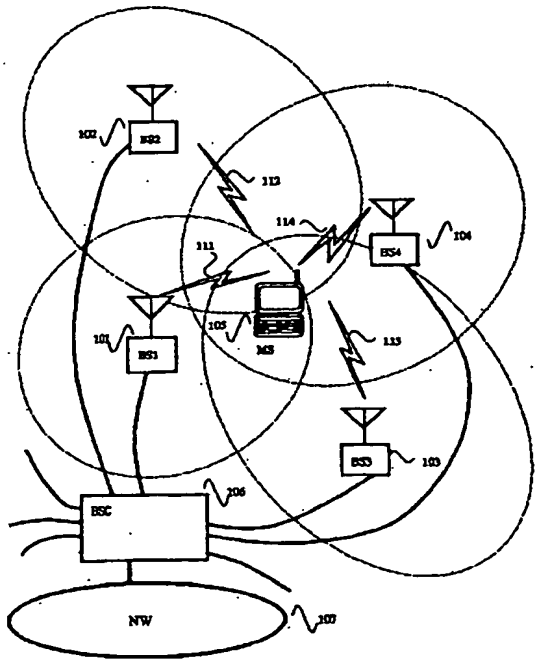
神奈川県横浜市戸塚区戸塚町216番地　株式会社日立製作所通信システム事業本部内
(74)代理人　100075096
弁理士　作田　康夫

最終頁に続く

(54)【発明の名称】　通信システム及びその通信方法

(57)【要約】
【課題】無線通信システムの高速伝送化及び無線資源の有効利用を図る。
【解決手段】無線端末105と前記無線端末と通信回線を介して通信する複数の無線基地局101～104とからなる通信システムにおいて、通信回線の回線品質111～114に基づいて、通信に使用すべき通信回線を選定し、選定された通信回線ごとに通信情報を分割し、分割された通信情報を選定された通信回線を介して通信することにより高速伝送を可能とする。

■１



【特許請求の範囲】

【請求項１】無線端末と前記無線端末と通信回線を介して通信する複数の無線基地局とからなる通信システムにおいて、前記通信回線の回線品質に基づいて、通信に使用すべき複数の通信回線を選定し、選定された前記複数の通信回線ごとに通信情報を分割し、前記分割された通信情報を前記選定された通信回線を介して通信することを特徴とする通信システム。

【請求項２】前記選定された前記複数の通信回線ごとに通信情報を分割する際に、前記通信情報を誤り訂正符号化し、さらに、インタリーブ化した後に分割することを特徴とする請求項１記載の通信システム。

【請求項３】無線端末と、前記無線端末と通信する複数の基地局と、前記基地局を制御する基地局制御局とを含む通信システムの通信方法において、前記無線端末と前記複数の基地局との間の複数の伝送路のそれぞれの通信品質を算出し、前記算出された各通信品質に基づいて前記基地局ごとに前記無線端末が送信可能な伝送速度を算出し、前記算出された各伝送速度に基づいて各前記基地局ごとに情報を配分し、前記配分された情報をそれぞれに対応する前記基地局に対して各前記基地局ごとに定められた伝送速度にて送信し、前記配分された情報を各前記基地局において受信し、各前記基地局は前記受信した情報を前記基地局制御局に送信し、前記基地局制御局は各前記基地局が送信した情報を受信し、前記受信した各基地局からの情報を前記基地局制御局において再合成することを特徴とする通信方法。

【請求項４】無線端末と、前記無線端末と通信する複数の基地局と、前記基地局を制御する基地局制御局とを含む通信システムの通信方法において、前記無線端末と複数の前記基地局との間の複数の伝送路のそれぞれの通信品質を算出し、前記算出された各通信品質に基づいてそれぞれの前記基地局が前記無線端末に対し送信可能な伝送速度を算出し、前記基地局制御局は、前記無線端末に送信すべき情報を前記算出された各伝送速度に基づいて各前記基地局ごとに配分し、各前記基地局は、前記配分された情報を各前記基地局ごとに定められた伝送速度にて送信し、前記無線端末は、各前記基地局が送信した情報を受信し、前記無線端末は、前記受信した各基地局からの情報を再合成することを特徴とする通信方法。

【請求項５】前記情報を配分する前に、前記情報を誤り訂正符号化し、さらに、インタリーブ化した後に配分することを請求項３乃至請求項４に記載の特徴とする通信システム。

【請求項６】無線端末と通信する複数の基地局を制御する基地局制御局において、前記無線端末と各前記基地局との伝送路の通信品質を記憶する記憶装置と、前記記憶装置に記憶された各伝送路ごとの通信品質に基づいて各基地局ごとに適応すべき伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置により算出された各基地局ごとの伝送速度にもとづいて各基地局ごとに通信情報を分割する分割装置と、前記分割装置により分割された通信情報を、それぞれの前記基地局に送信する送信装置とを備えることを特徴とする基地局制御局。

【請求項７】前記通信品質は、前記無線端末が通信路ごとに収集したものであることを特徴とする請求項６記載の基地局制御局。

【請求項８】複数の基地局と通信を行う無線端末において、複数の前記基地局からの信号を受信する受信装置と、前記受信装置で受信された複数の信号の各通信品質を算出する通信品質算出装置と、前記通信品質算出装置により算出された各通信品質に基づいて前記基地局ごとに送信可能な伝送速度を算出する伝送可能速度算出装置と、前記伝送可能速度算出装置により算出された各伝送速度に基づいて各前記基地局ごとに送信すべき情報を分割する分割装置と、前記分割装置により分割された情報を各前記基地局に送信する送信装置とを備えることを特徴とする無線端末。

【請求項９】複数の基地局と通信を行う無線端末において、前記基地局からの信号を受信する受信装置と、前記受信装置で受信された信号の信号対干渉波電力比を算出する信号対干渉波電力比算出装置と、前記信号対干渉波電力比に基づいて、前記基地局への伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置により算出された伝送速度を前記基地局ごとに対応させてなるテーブルを作成するテーブル作成装置と、前記テーブル作成装置により作成されたテーブルを記憶する記憶装置と、前記記憶装置に記憶されたテーブルに基づいて複数の前記基地局ごとに通信情報を分割する分割装置と、前記分割装置により分割された通信情報を各基地局に送信する送信装置とを備えることを特徴とする無線端末。

【請求項１０】複数の基地局と通信を行う無線端末において、前記基地局のうちいずれか一つから送信される情報分割命令信号を受信する受信装置と、前記受信装置により受信された情報分割命令信号に基づいて各前記基地局ごとに送信すべき情報を分割する分割装置と、前記分割装置により分割された情報を各前記基地局ごとに定められた伝送速度にて送信する送信装置とを備えることを特徴とする無線端末。

【請求項１１】前記情報分割命令信号には、各基地局ごとの伝送速度及び分割の割合が含まれ、前記分割装置は、前記情報分割命令信号ふくまれる前記分割の割合にもとづいて情報を各基地局ごとに分割し、前記送信装置は、前記情報分割命令信号にふくまれる前記伝送速度にもとづいて前記分割装置により分割された情報を各前記基地局ごとに送信することを特徴とする請求項１０に記載の無線端末。

【請求項１２】無線端末と通信する複数の基地局を制御する基地局制御局において、前記各基地局ごとの受信品質に基づいて該各基地局ごとに適応すべき受信伝送速度

を算出する伝送速度算出装置と、前記伝送速度算出装置が算出した前記各基地局ごとの受信伝送速度を少なくともひとつの基地局を経由して前記無線端末に送信する送信装置と、前記送信装置が送信した前記受信伝送速度に基づいて、前記無線端末が前記各基地局ごとに分割して送信した通信情報を該各基地局を介して受信する受信装置と、前記受信装置で受信した各基地局ごとに分割さた通信情報を多重化する多重化装置と、を備えることを特徴とする基地局制御局。

【請求項１３】無線端末と通信する複数の基地局を制御する基地局制御装置において、前記各基地局が算出した各基地局の上り回線の信号対干渉波電力比に基づいて、前記上り回線で送信可能な伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置だ算出した前記伝送速度を前記基地局ごとに対応させるテーブルを作成するテーブル作成装置と、前記テーブル作成装置により作成されたテーブルを記憶する記憶装置と、前記無線端末が前記複数の基地局にたいして分割して送信した複数の通信情報を前記記憶装置に記憶されたテーブルに基づいて多重化し分割前の情報に復元する多重化装置と、を備えることを特徴とする基地局制御局。

【請求項１４】基地局制御局に制御される複数の基地局と通信を行う無線端末において、前記複数の基地局が下り回線を介して送信する下り信号の通信品質を算出する通信品質算出装置と、前記通信品質算出装置が算出した前記下り信号ごとの各通信品質に基づいて前記各基地局の各下り回線で送信可能な伝送速度を算出する伝送可能速度算出装置と、前記伝送可能速度算出装置が算出した前記各基地局の伝送速度を少なくともひとつの基地局を経由して前記基地局制御局に送信する送信装置と、前記伝送速度に基づいて前記基地局制御局が前記複数の基地局ごとに分割して送信する通信情報を、該伝送速度に基づいて多重化し分割前の情報に復元する多重化装置と、を備えることを特徴とする無線端末。

【請求項１５】基地局制御局に制御される複数の基地局と通信を行う無線端末において、前記複数の基地局が下り回線を介して送信する下り信号の通信品質を算出する通信品質算出装置と、前記通信品質をいずれかの前記基地局を介して前記基地局制御局に送信する送信装置と、前記基地局制御局が前記通信品質に基づいて下り回線ごとの伝送速度を算出し、前記算出された伝送速度に基づいて前記複数の下り回線ごとに分割し送信した通信情報を受信する受信装置と、前記受信装置が受信した前記通信情報を前記伝送速度に基づいて多重化する多重化装置と、を備えることを特徴とする無線端末。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、無線通信方法及び無線通信装置に係り、特に、セルラー方式等の無線通信システムにおいて、端末と基地局および基地局制御装置間で設定し運用する無線通信方法に関する。

【０００２】

【従来の技術】従来の端末はひとつの基地局と通信を行うことがほとんどであるが、例外的にハンドオーバーの際には端末が複数の基地局と接続する。たとえば従来技術の例として、USP5,101,501, USP5,267,261, USP5,088,108, USP5,109,528, USP5,327,577, 特表平10-511835号公報に記載された発明がある。

【０００３】一般に無線通信システムは、通信サービスの連続性を保証すべく、基地局のサービスエリアを隣接基地局間でオーバーラップさせている。ハンドオーバは、このオーバーラップされた領域で行われる。端末はハンドオーバの際に複数の基地局と回線接続を行なうが、いずれの回線も同一内容のデータが送受信される。

【０００４】

【発明が解決しようとする課題】セルラーなどの無線端末は、一の基地局と通信中においても、他の基地局ともある一定の伝送速度で通信可能な電波状態にあることがある。このような電波環境は、主に他のユーザが少なく、空き回線が存在する場合に多く発生する。例えばCDMA（符号分割多元接続方式）では、他の端末との干渉電力比によって同時に基地局と接続できるユーザ数が決定されるため、他の端末が少ない状況であれば干渉電力が小さいため、他の基地局とも同時に通信化可能な電波環境となる。しかし、従来のシステムでは、このような電波環境にあったとしても、端末はひとつの基地局としか接続されていないため、伝送速度がひとつの回線の最大値に制限されてしまうという課題がある。一方で端末は、ハンドオーバのために複数の無線基地局と同時に接続する場合があるが、ハンドオーバの性質上、この同時に接続可能な回線はいずれも同一の情報しか送ることができない。従って、他の無線回線を用いて他の基地局との接続可能な電波状態にあったとしても、他の無線回線には現在接続中の回線と同一の情報しか送受信できない構造であるため、無線リソースを有効利用できない結果を招く。結局、伝送の場合には伝送速度が回線あたりの最大値で制限されてしまうという課題がある。

【０００５】本発明の目的は、上記課題に鑑み、一の基地局と接続中の端末が他の無線基地局とも接続可能な電波環境にある場合は、他の無線基地局とも同時に接続することで、端末と網側で送受信すべき情報を分散して送ることにより、伝送速度を向上させることを目的とする。

【０００６】また、複数の無線基地局と同時に通信する際に、各無線基地局には、その電波環境に応じて回線速度を決定し、無線リソースの有効活用と、より安定した通信サービスを提供することを目的とする。

【０００７】さらに、複数の無線基地局と通信中に電波環境が悪化したときには、それに応じて伝送速度を可変させるか、時には回線を切断することで、電波環境に応

じたダイナミックな通信サービスを提供することを目的とする。

【０００８】さらに、送信する情報を誤り訂正符号化してインタリーブしたのちに複数の基地局との回線に分配して送信し、受信側では書く回線を多重化した後デインタリーブし誤り訂正復号することで、一部の回線の通信品質が劣化しても、多重化して誤り訂正後の信号の劣化を低く抑えることを目的とする。

【０００９】さらに、本発明では、電波環境がよければ高速な回線を割り当てるが、電波環境が悪化すればその伝送速度を低速にすることでベストエフォート型の無線サービスを提供することを目的とする。

【００１０】

【課題を解決するための手段】本願発明の無線端末は、上述の課題を解決すべく、複数の基地局からの信号を受信する受信装置と、前記受信装置で受信された複数の信号の各通信品質を算出する通信品質算出装置と、前記通信品質算出装置により算出された各通信品質に基づいて前記基地局ごとに送信可能な伝送速度を算出する伝送可能速度算出装置と、前記伝送可能速度算出装置により算出された各伝送速度に基づいて各前記基地局ごとに送信すべき情報を分割する分割装置と、前記分割装置により分割された情報を各前記基地局に送信する送信装置とを備える。

【００１１】また、本願発明では、通信品質として信号対干渉波電力比（例えばEb/N0、Ec/I0、あるいはこれらの組み合わせ）を用いる。

【００１２】また、本願発明の無線端末は、前記基地局からの信号を受信する受信装置と、前記受信装置で受信された信号の信号対干渉波電力比Eb/N0を算出するEb/N0算出装置と、前記受信装置で受信された信を算出する信号対干渉波電力比算出装置と、前記信号対干渉波電力比に基づいて、前記基地局への（または前記基地局からの）伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置により算出された伝送速度を前記基地局ごとに対応させてなるテーブルを作成するテーブル作成装置と、前記テーブル作成装置により作成されたテーブルを記憶する記憶装置と、前記記憶装置に記憶されたテーブルに基づいて複数の前記基地局ごとに通信情報を分割する分割装置と、前記分割装置により分割された通信情報を各基地局に送信する送信装置とを備える。

【００１３】また、本願発明の基地局制御局は、前記無線端末と各前記基地局との伝送路の通信品質を記憶する記憶装置と、前記記憶装置に記憶された各基地局ごとの通信品質に基づいて各基地局ごとに適応すべき伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置により算出された各基地局ごとの伝送速度にもとづいて各基地局ごとに通信情報を分割する分割装置と、前記分割装置により分割された通信情報を、それぞれの前記基地局に送信する送信装置とを備える。なお、通信品質は、無線端末あるいは無線基地局が通信路ごとに収集したものでる。

【００１４】また、本願発明の無線端末は、基地局のうちいずれか一つから送信される情報分割命令信号を受信する受信装置と、前記受信装置により受信された情報分割命令信号に基づいて各前記基地局ごとに送信すべき情報を分割する分割装置と、前記分割装置により分割された情報を各前記基地局ごとに定められた伝送速度にて送信する送信装置とを備える。なお、情報分割命令信号には、各基地局ごとの伝送速度及び分割の割合が含まれ、前記分割装置は、前記情報分割命令信号ふくまれる前記分割の割合にもとづいて情報を各基地局ごとに分割し、前記送信装置は、前記情報分割命令信号にふくまれる前記伝送速度にもとづいて前記分割装置により分割された情報を各前記基地局ごとに送信する。

【００１５】なお、情報分割命令信号の代わりに伝送速度制御信号を用い、この伝送速度制御信号に含まれる伝送速度に基づいて情報を各基地局ごとに分割するように構成してもよい。

【００１６】本願発明の通信方法は、無線端末と、前記無線端末と通信する複数の基地局と、前記基地局を制御する基地局制御局とを含む通信システムの通信方法であって、前記無線端末と複数の前記基地局との間の複数の伝送路のそれぞれの通信品質を算出し、前記算出された各通信品質に基づいて前記基地局ごとに前記無線端末が送信可能な伝送速度を算出し、前記算出された各伝送速度に基づいて各前記基地局ごとに情報を配分し、前記配分された情報をそれぞれに対応する前記基地局に対して各前記基地局ごとに定められた伝送速度にて送信し、前記配分された情報を各前記基地局において受信し、各前記基地局は前記受信した情報を前記基地局制御局に送信し、前記基地局制御局は各前記基地局が送信した情報を受信し、前記受信した各基地局からの情報を前記基地局制御局において再合成する。

【００１７】また、本願発明の通信方法は、無線端末と複数の基地局との間の複数の伝送路のそれぞれの通信品質を算出し、前記算出された各通信品質に基づいてそれぞれの前記基地局が前記無線端末に対し送信可能な伝送速度を算出し、前記基地局制御局は、前記無線端末に送信すべき情報を前記算出された各伝送速度に基づいて各前記基地局ごとに配分し、各前記基地局は、前記配分された情報を各前記基地局ごとに定められた伝送速度にて送信し、前記無線端末は、各前記基地局が送信した情報を受信し、前記無線端末は、前記受信した各基地局からの情報を再合成する。

【００１８】なお、伝送路の通信品質は、無線端末または基地局が算出するが、無線端末が算出する場合は、基地局を介して基地局制御局に通信品質を報告してもよい。基地局制御局はこれらの通信品質に基づいて伝送速度を算出する。なお、無線端末または基地局で算出して

も良い。

【００１９】また、本願発明の通信システムは、無線端末と前記無線端末と通信回線を介して通信する複数の無線基地局とからなり、通信回線の回線品質に基づいて、通信に使用すべき通信回線を選定し、選定された通信回線ごとに通信情報を分割し、分割された通信情報を選定された通信回線を介して通信することにより高速伝送を可能とするものである。

【００２０】また、本願発明の通信システムは、通信情報の分割前に送信側で誤り訂正符号とインタリーブを行い、受信側で多重後にデインタリーブ復号を行うため一部の通信回線品質が劣化しても多重化後の信号劣化を最小限にすることを可能とする。

【００２１】また、本願発明の基地局制御局は、各基地局ごとの受信品質に基づいて該各基地局ごとに適応すべき受信伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置が算出した前記各基地局ごとの受信伝送速度を少なくともひとつの基地局を経由して前記無線端末に送信する送信装置と、前記送信装置が送信した前記受信伝送速度に基づいて、前記無線端末が前記各基地局ごとに分割して送信した通信情報を該各基地局を介して受信する受信装置と、前記受信装置で受信した各基地局ごとに分割さた通信情報を多重化する多重化装置とを備える。

【００２２】また、本願発明の基地局制御局は、前記各基地局が算出した各基地局の上り回線の信号対干渉波電力比に基づいて、前記上り回線で送信可能な伝送速度を算出する伝送速度算出装置と、前記伝送速度算出装置だ算出した前記伝送速度を前記基地局ごとに対応させるテーブルを作成するテーブル作成装置と、前記テーブル作成装置により作成されたテーブルを記憶する記憶装置と、前記無線端末が前記複数の基地局にたいして分割して送信した複数の通信情報を前記記憶装置に記憶されたテーブルに基づいて多重化し分割前の情報に復元する多重化装置とを備える。

【００２３】また、本願発明の無線端末は、前記複数の基地局が下り回線を介して送信する下り信号の通信品質を算出する通信品質算出装置と、前記通信品質算出装置が算出した前記下り信号ごとの各通信品質に基づいて前記各基地局の各下り回線で送信可能な伝送速度を算出する伝送可能速度算出装置と、前記伝送可能速度算出装置が算出した前記各基地局の伝送速度を少なくともひとつの基地局を経由して前記基地局制御局に送信する送信装置と、前記伝送速度に基づいて前記基地局制御局が前記複数の基地局ごとに分割して送信する通信情報を、該伝送速度に基づいて多重化し分割前の情報に復元する多重化装置とを備える。

【００２４】また、本願発明の無線端末は、複数の基地局が下り回線を介して送信する下り信号の通信品質を算出する通信品質算出装置と、前記通信品質をいずれかの前記基地局を介して前記基地局制御局に送信する送信装置と、前記基地局制御局が前記通信品質に基づいて下り回線ごとの伝送速度を算出し、前記算出された伝送速度に基づいて前記複数の下り回線ごとに分割し送信した通信情報を受信する受信装置と、前記受信装置が受信した前記通信情報を前記伝送速度に基づいて多重化する多重化装置とを備える。

【００２５】また本願発明では、上述の課題を解決すべく、次のような通信方法を採用する。

【００２６】(1) 端末発信の場合はアクセスチャネル、基地局発信の場合はページングチャネルにより端末とひとつの基地局間でひとつの無線回線を設定する。これは従来のセルラーによる無線回線設定方法と同じである。

【００２７】(2) 端末と基地局および基地局制御装置のいずれかにおいて規定されている伝送速度よりもさらに高速伝送要求があり、端末に、別のチャネルを用いて、その送信または受信能力がある場合を仮定する。端末は受信している接続中の基地局を含む、１または複数の基地局の制御信号電力を前述の(1)で設定した回線により基地局および基地局制御装置にリポートする。たとえばCDMAの場合はパイロット信号電力をリポートする。

【００２８】(3) (2)のリポート結果から基地局制御装置は、基地局ごとの無線リソースと端末の送受信可能な伝送速度から、接続候補の基地局を選ぶ。さらに各候補基地局に新たに回線を接続可能かどうかを判断し、無線端末の各候補基地局ごとの干渉雑音電力報告から割り当てる伝送速度を決定する。

【００２９】(4) 基地局制御装置は(1)で設定した回線を用いて、接続可能な他の基地局のリストと各基地局に割り当て可能な伝送速度を、端末にリポートする。

【００３０】(5) 端末は(4)の指示に従い、新たな１または複数の基地局との回線を設定する。この手順は、新たに接続しようとする基地局数が２を超える場合があることを除くと、ハンドオーバー時と同じである。

【００３１】(6) 基地局制御装置は(5)における回線設定の完了を確認するとともに、それを端末へ通知する。下り回線(基地局から端末へ送信)では、基地局制御装置が送信信号を伝送速度に見合わせて回線ごとに分配し、基地局ごとに、独立した信号系列とみなして変調し、端末に送信する。端末は１または複数の基地局から受信した信号を回線ごとに各々独立して復調したのち、それらを信号系列順に多重化し、送信された信号を再生する。

【００３２】(7) 上り回線（端末から基地局へ送信)の場合は、(2)の結果から、基地局制御装置が、接続候補基地局を選ぶ。さらに、各候補基地局に新たに回線を接続可能かを判断し、上り回線の伝送速度を、下り回線の受信レベルから推定して決定し、無線端末に報告する。このとき、基地局制御装置は無線端末に接続する基地局のみを報告し、伝送速度は無線端末が決定して良い。無線端末と基地局制御装置間で回線接続手順が完了する

と、端末が送信信号を基地局との間で伝送可能な伝送速度に見合わせて回線ごとに分配し、１または複数の基地局に対し各々独立して変調を行ない送信する。基地局制御装置は１または複数の基地局から受信した信号を各々独立して回線ごとに復調したのち、それらを信号系列順に多重化し、送信された信号を再生する。

【００３３】(8) また、誤り耐力を強くするために、基地局制御装置および端末の送信側においては、信号を回線ごとに分配する前に、誤り訂正符号化とインタリーブを行なってもよい。その場合、基地局制御装置の受信側では、各基地局で復調した信号を基地局制御装置で再配列し、送信側と逆手順でデインタリーブし誤り訂正復号化を行なう。端末の受信側でも同様で、各受信ポートで復調した信号を再配列し送信側と逆手順でデインタリーブし誤り訂正復号化を行なう。これにより、複数ある回線のうち、ある回線の品質が急激に劣化した場合においても、回線品質の劣化を最小にとどめることができる。

【００３４】(9) 複数の回線を、端末と基地局および基地局制御装置間で設定した後は、端末と基地局制御装置間の制御情報の送受信はどの回線を用いてもよい。

【００３５】(10) 端末の移動に応じて端末と基地局間の電波状態は変化する。したがって、ある回線は断にし、新たに回線を設定する必要がある。電波環境とユーザの必要に応じて回線の設定と解除をおこなうことにより、通信を維持する。

【００３６】なお、無線端末が送信する信号（上り回線）の伝送速度は、基地局制御局が、直前の各基地局で受信した通信品質にもとづき伝送速度テーブルを参照し無線リソースが使用可能かどうかを判断して決め、基地局制御局は、決定した伝送速度情報を少なくともひとつの基地局を経由して無線端末に通知する。

【００３７】また、基地局（基地局制御局）が送信する信号（下り回線）の伝送速度は，送信する直前に無線端末で受信された各基地局との通信品質にもとづき無線端末が伝送速度テーブルを参照して決める。各基地局が送信可能な伝送速度の情報は，無線端末から少なくともひとつの基地局を経由して基地局制御局へ通知される。ただし，すべての無線リソースの管理を無線端末では行えないために，無線端末は各基地局との通信品質を基地局制御局へ通知し，伝送速度は基地局制御局により無線リソースの使用可否を判断の上，決定してもよい。

【００３８】

【発明の実施の形態】ディジタル通信システムの最大伝送速度はそのシステムの変調方式に応じて、ディジタル信号電力と干渉雑音電力の比で決定される。ビット当たりの電力と帯域当たりの干渉雑音電力密度の比でこれを定義する場合はEb/Noで表されることが多い。またCDMAなど周期的PN符号をパイロット信号の符号として用いたシステムでは、パイロット電力のPNチップ周期にわたる積分値(Ec)と帯域内の全受信電力スペクトラム密度(Io)で運用することも可能で、この場合にはEc/Ioで表されることが多い。なお、Eb/No，Ec/Ioの代わりに他の回線品質を表す尺度を用いても構わない。本稿では、CDMAに適用した例を中心に説明し、以下これらの記述を用いる。

【００３９】（実施例１）図1に本発明を適用するセルラーシステムの構成を示す。端末（Ｍｏｂｉｌｅ Ｓｔａｔｉｏｎ：以下ＭＳ）１０５は無線回線を通じて基地局101～104(Base Station:以下BS)と接続する。また各々のBSは通信回線により基地局制御装置106(Base Station Controller:以下BSC)と接続する。なおBSCは上位の網107と接続する。なお、本発明で特徴的なのは、各回線111～114がそれぞれ独立した回線であり、回線速度も伝送される情報も異なる点である。すなわち通常ひとつのBSを介して送受信していた情報を複数のBSに分散して送受信することで、全体として高速伝送を可能にする。

【００４０】図２には、図１をより詳しくした図面を記載している。図２では回線111のEc/IOが最も高いため、伝送速度がもっとも高く割り当てられる。以下、回線112～114もEc/IOにしたがって伝送速度が割り当てられる。なお、回線間での干渉制御条件下で、無線端末105は最大でＫ＋Ｌ＋Ｍ＋Ｎの伝送速度での通信が可能となる。

【００４１】本発明のBSCの構成を、図２を用いて説明する。フォワードリンクは、ネットワーク107からのデータを符号化しインタリーブする符号化+インタリーブ部208，その出力を各BSごとに設定された伝送速度に応じて分離するための制御を行うバッファ/分離部207，および各BSとのインタフェース機能とデータ伝送を行うデータ分配装置206からなる。また、リバースリンクは、各BSからのトラヒックおよび制御データを収集するデータ集線部201、その出力をバッファリングし、もとのデータに多重復元するバッファ/多重化部、およびその出力をデインタリーブし復号化を行うデインタリーブ＋復号部203からなる。なお、前述のフォワードリンク，リバースリンクの各構成部は、伝送速度の割り当てを行う伝送速度制御部204，BSC配下の各BSの使用可能な無線リソースを管理し、配分する無線リソース管理部205を含んでいる。

【００４２】一方MSは、パイロット信号のEc/Ioが最も良好なBSと接続することにより、最もEb/Noの良好なBSの回線を得る。しかし、他のBSが送信するパイロット信号のEc/Ioが、システム運用に必要な伝送速度と回線品質を保つのに必要なEb/Noが得られる下限値を上回るのであれば、伝送速度を適切に選択し対応させることによって、その回線でも通信が可能である。ここでは、BS101-104から受信した信号のEb/Noを順にk,l,m,n(k>l>m>n)とし、対応する伝送速度(bit per second:以下bps)をK,L,M,N(K>L>M>N)とした。無線リソース管理部205は、MS105あるいはBS101-104で検出した回線111-114の

回線品質k,l,m,nを管理する。伝送速度制御部204は、無線リソース管理部205に格納される各回線の回線品質を読出し、この回線品質に基づいて各回線毎の可能伝送速度を算出する。伝送速度制御部204は、算出した各回線ごとの伝送速度をテーブルとして格納する。なお、図１，２には４つのBSのみ記載されているが、４以上あるいは４以下であってもよい。

【００４３】次に、BSが送信する下り回線を例に説明する。NW107からの情報は、図３の301で示される規定された情報長ごとに、フレーム識別子(ID)，フレーム属性(Type)、および引き続く誤り訂正符号化が畳込み符号化と仮定すると、テールビット(Tail)が付加されたフレーム構成302となる。このフレーム302は符号化部(FEC+Interleave)208にて符号化され、符号化されたシーケンス(FEC+Interleaved Sequence)303となる。このときの符号化パラメータは伝送速度制御部204と無線リソース管理部205によって規定される。バッファ/分離部207は、符号化された情報系列を一旦格納する。データ分配部206は、伝送速度制御部204のテーブルに基づいて、バッファ207に格納された情報系列を、各BSごとに、図３の304で示される適切な情報長でサブフレーム分割される。例えば、BS101の回線111には、K/（K+L+M+N)の割合で、BS102の回線112には、L/（K+L+M+N)の割合でサブフレーム長が決定される。サブフレームは伝送されるBSと多重分離の際の規則を規定したフレーム識別子(ID)とフレーム属性(Type)が付加され、図３のフレーム構成305となる。サブフレームは分配部(Data Distribution)206によりBS101-104へ伝送される。このとき、フレーム302，サブフレーム305に、リバースリンクの回線品質情報および制御情報などを追加してもよい。データ分配部206は、各BSにサブフレームを送信する。サブフレームを受信した各BSは、無線周波数に載せてサブフレームをMS105に送信する。

【００４４】なお、無線リソース管理部205の代わりに、伝送速度制御部204が、リバースリンクによりMS105で収集された各フォワードリンクのEc/Io，Eb/Noおよびフレーム誤り率(以下FER)などの回線品質情報を直接的に管理してもよい。その場合は、伝送速度制御部204は、テーブルに各回線の品質を格納するとともに、テーブルに格納された回線品質に基づいて回線毎のフォワードリンク伝送速度を決定し、同様に各回線毎の伝送速度をテーブルに格納する。無線リソース管理部205は、各BSごとの無線リソースを管理し、各BSごとに予め決められた伝送容量を越えないように制御する。

【００４５】MS105は各BS101-104が送信するサブフレームを受信復調し、サブフレーム305の識別子および属性に従って、フレーム303に組み立て直し、デインタリーブおよび誤り訂正符号化を行ないフレーム302を検出し、情報系列301を再生し、元の情報を復元する。

【００４６】リバースリンクは全く逆の手順となる。MS105では送信する情報系列を誤り訂正符号化、インタリーブを行ない、変調回路と高周波回路を擁する各無線ポートに分配する。この無線ポートはフォワードリンクのBSの無線インタフェース機能に相当する。リバースリンクのデータ分配は、MSが各BSごとのEb/Noに基づいて分配を決定する。一方、新たに回線を設定する場合には回線を設定しようとするBSからのパイロット信号をモニタし、そのEc/Ioにより伝送速度を決めることができる。

【００４７】データ集線部201は、受信したリバースリンクの情報をサブフレーム305のフォーマットとして収集する。さらにデータ集線部201は、フォワードリンクFERなど回線品質管理に必要な制御情報を抽出する。バッファ/多重部202は、サブフレーム305を一旦メモリに格納し、サブフレーム305の識別子および属性に従って、符号化されたシーケンス304に組み立てる。復号部303は、シーケンス304をデインタリーブおよび復号処理する。復号されたデータは最終的にフレーム単位でその品質の確認が行なわれ、NW107に送信される。　ところで、各回線の伝送速度は常に一定というわけではない。伝送速度制御部204は、随時報告される回線品質の変化に応じて、伝送速度を再度計算しなおす。

【００４８】（実施例２）

１．システムの構成

より詳細なBSCの構成を、図４を用いて説明する。BSCは、上りFER検出回路＋バッファ回路401，多重化回路402，デインタリーブ回路403，復号回路404，フレーム分解回路405，出力データインタフェース406，下り伝送速度制御回路407，伝送速度テーブル408，上り全チャネルFERモニタ回路409，BS-IF回路410，バッファ＋全伝送速度制御回路411，インタリーバ412，符号化回路413，フレーム合成回路414，ネットワーク・IF415，インタリーブ，符号化パラメータテーブル417などから構成される。

【００４９】図５にＢＳの構成図を示す。BSには複数の端末と通信すべく、複数の受信部533-1～533-n，複数の送信部534-1～534-nが含まれている。BSの受信部は、受信高周波回路501，複素逆拡散回路502，直交逆拡散回路503，デインタリーバ504，復号回路505，下り電力制御部507，Eb/NOモニタ回路508，チャネルFER検出回路509などから構成される。一方送信部は、送信高周波回路510，複素拡散回路511，利得制御回路512，直交拡散回路513，上り電力制御ビット多重回路514，インタリーブ回路515，符号化回路516，フレーム生成回路517などから構成される。

【００５０】図６に本発明の端末構成を示す。MS105には複数のBSと通信すべく、複数の受信部633-1～633-n，複数の送信部634-1～634-nが含まれている。MSの受信部は、受信高周波回路601，複素逆拡散回路602，直交逆拡散回路603，デインタリーバ604，復号回路605，下りEc/IO検出回路606，上り電力制御部607，Eb/NOモニタ回路6

08，FER検出回路609などから構成される。一方送信部は、送信高周波回路610，複素拡散回路611，利得制御回路612，直交拡散回路613，電力制御ビット多重回路614，インタリーブ回路615，符号化回路616，フレーム生成回路617などから構成される。

【００５１】図７に複数の送受信部に共通の制御部を示す。共通の制御部735は、バッファ回路718，多重化回路719，デインタリーブ回路720，復号回路721，フレーム分解回路722，データ出力ＩＦ723，上り伝送速度制御回路724，下りリンクFERモニタ回路725，伝送速度テーブル740，分配回路726，バッファ及び全伝送速度制御回路727，インタリーバ728，復号化回路729，フレーム生成回路730，入力データＩＦ731，無線リソース管理部732，インタリーブ・符号化パラメータテーブル742などから構成される。

【００５２】２．システム動作

次に、フォワードリンクの動作を説明する。BSCのフレーム生成回路414は、ネットワークからの入力データをフレーム単位に分分割し、さらに受信側で情報識別に必要な信号を付加する(630A)。符号化回路413は、フレーム生成回路414の出力を誤り訂正符号化する。インタリーバ回路412は、情報の順列を変更することでインタリーブ化する(628A)。このときの符号化パラメータやインタリーブパラメータは無線リソース管理部416が与える。その後、バッファ/全速度制御回路411は、複数のBSから送信される情報の総伝送速度を決定する。フォワードリンク伝送速度制御回路407は、リバースリンクにより伝達される全フォワードリンクのフレーム誤り率（以下FER）と、同じく各フォワードリンクのEb/NoまたはEc/Io値あるいはFERに基づいて、各回線ごとの伝送速度を算出する。この伝送速度の制御はBSC配下にある全BSの無線リソースの使用状況を考慮して行われる。その後、BS-IF回路410は、各BS対応に信号が振り分ける(626A)。BS-IF回路410は、各BSごとに分離した信号(626A)を各々変調し、無線伝送する。

【００５３】BSは、フォワードリンク用に複数の送信部534-1～534-n(nは2以上の自然数)を備える。フレーム生成回路517は、BSとMS間の無線インタフェースに適合するようにフレーム化を行なう(617A)。符号化回路516はフレーム生成回路の出力を誤り訂正符号化する。インターリーブ回路515は、インタリーブ化のため順列データのを変更する(615A)。リバースリンク電力制御ビット多重回路514は、インターリーブ回路515の出力に電力制御情報を付加する。直交拡散回路513は、インタリーブ回路の出力を直交変調する。利得制御回路512は、送信電力利得を調整する。複素拡散回路511は送信電力利得の調整された情報に複素拡散を施す。高周波回路510は、複素拡散後の情報を送信周波数信号に変換しMSに伝送する。

【００５４】次に図６，７を用いてMSのフォワードリンク受信構成要素とその機能を説明する。MS105には、複数の回線を同時に受信できるよう複数の受信機633-1～633-n(nは2以上の自然数)が搭載されている。各受信機は各々独立に動作する。受信高周波回路601で受信された信号は複素逆拡散回路602にてセルの照合が行われる。続いて直交逆拡散回路603でチャネルが識別され、デインターリーブ回路604および復号回路605で誤り訂正が行われる。受信機にはリバース電力制御回路607，Eb/Noモニタ回路608，FER検出回路609が搭載され、電力制御のためのモニタと制御を行う。

【００５５】MS共通制御部735にて、各受信機の出力はバッファ回路718に集められる。ここでタイミング調整が行われ、多重化回路719で各受信データの多重化が行われる。多重化されたデータはBSCのインタリーブ回路628にてインタリーブされているため、MS共通制御部735のデインタリーブ回路720で順列を戻す操作を実行する。そののち復号回路721にて誤り訂正操作を実行する。その後フレーム分解回路722で元のデータが抽出され、その出力データ723は端末機器のデータ処理部へと伝送される。この過程で、復号回路721出力はフォワードリンクFERモニタ回路で全フォワードリンクのFERを検出する。このFER情報はリバースリンクにてBSを経由しBSCへ伝送される。

【００５６】MSで受信する場合のフレームの合成例を説明する。BSからの各回線はMS受信機にて独立して復調され、サブフレーム718Aとなる。ここでID，属性が読み出されるとともに品質(QI)がチェックされる。IDの配列により、複数の回線にて受信された信号を多重化する順序が読み出される。属性により、制御信号などは優先順位を変えて処理が行われる。サブフレーム718Aの情報系列のみが取り出されて多重化される。多重化後の情報719Aはまだインタリーブとfecが行われているため取り出すことができない。まずデインタリーブ回路720にて、回線間でインタリーブされた信号の順列を元に戻す。その後、復号回路にてFECされた信号を誤り訂正し、フレーム721Aを再生する。IDなどのオーバーヘッドを除き、722Aが受信すべき信号である。

【００５７】次にリバースリンクについて説明する。MS105のフレーム生成回路730は、データ端末機器からの入力データをフレーム単位に分ける。このフレームは符号化回路729で誤り訂正符号化されインタリーバ回路728で情報の順列が変更される。このときの符号化パラメータやインタリーブパラメータはMS無線リソース管理部732が与える。その後、バッファ/全速度制御回路727は、複数のBSに送信すべき情報の総伝送速度を決める。この制御は、フォワードリンクにより伝達される全リバースリンクのフレーム誤り率と、同じく各リバースリンクのEb/NoあるいはFERをもとに、リバースリンク伝送速度制御回路724により設定される。この制御はＭＳが接続可能な全BSの無線リソースの使用状況(例：接続可能な回線の

周波数，符号，タイムスロット)が考慮されなければならない。その後、分配回路726にてBS対応に信号が振り分けられる。各BS対応に送信機が一対一に割り当てられる。

【００５８】MSの送信機で、MSとBS間の無線インタフェースに適合するようにフレーム生成回路717でフレーム化を行なう。MSの各送信機は各BSごとに分離された信号を各々個別に変調し送信する。図７の例では、符号化回路716で誤り訂正符号化し、インターリーブ回路715で順列を変更し、そのデータにリバースリンク電力制御ビット多重回路714で電力制御情報を付加し、直交拡散回路713で直交変調を行い、利得制御回路712での送信電力利得調整，複素拡散回路711による変調ののち、高周波回路710にて送信周波数信号に変換されBSへ伝送される。

【００５９】次にBS，BSCのリバースリンク受信構成要素とその機能を説明する。BSには、複数の回線を同時に受信できるよう複数の受信機533-1～533-nが搭載されている。各受信機は各々独立に動作する。複素逆拡散回路502は、受信高周波回路501が受信した信号をMS送信信号と同期をとるため複素逆拡散を施す。続いて直交逆拡散回路503は、複素逆拡散後の情報を直交逆拡散を施し、チャネルを識別する。デインターリーブ回路504および復号回路505は、直交逆拡散後の情報に誤り訂正を行う。受信機にはフォワード電力制御回路507，Eb/Noモニタ回路508，FER検出回路509が搭載され，電力制御のためのモニタと制御を行う。

【００６０】BSにて、各BS受信機の出力はリバースFER検出回路+バッファ回路401に集められる。リバースFER検出回路+バッファ回路401は、受信データのタイミングを調整する。多重化回路402は各受信データを多重化する。多重化されたデータはMS共通制御部735のインタリーブ回路728にてインタリーブされている。そこでBSCのデインタリーブ回路403は順列を戻す操作を実行する。そののち復号回路404は、誤り訂正をする。その後フレーム分解回路622は元のデータを抽出し、その出力データをNWへと伝送する。リバースリンクFERモニタ回路409は、復号回路404の出力に基づいて、全リバースリンクのFERを検出する。このFER情報はフォワードリンクにてBSを経由しMS105に伝送される。

【００６１】上述の、説明において、BS，MSの送受信機は、高周波回路が個々に設定されており、MSと複数BS間の回線は異なる周波数で設定されることを前提に記述している。もしこれをTDMAに適用する場合であれば、回線割当ては同一周波数を用いてタイムスロットにより識別してもよい。また、CDMAのように、一つの周波数で複数回線設定可能なものは、送受信に先立ち、タイミング予約などの干渉コントロールを行うことにより、単一周波数での運用が可能である。

【００６２】３．伝送速度の制御方法

３．１ フォワードリンクについて

MS105は、パイロット信号のEc/Ioが最も良好なBSと接続することにより、最もEb/Noの良好なBSとの回線を得る。しかし、他のBSが送信するパイロット信号のEc/Ioが、システム運用に必要な伝送速度と回線品質を保つのに必要なEb/Noが得られる下限値を上回るのであれば、伝送速度を適切に選択し対応させることによって、その回線でも通信が可能である。このとき、現在説明にCDMAを仮定しているので、MSは複数のBSから同時に受信すると干渉となり伝送速度が低下する恐れがあるが、例えば回線(スロット)予約方式を用いることで、伝送速度を向上させることができる。ただし、ここでは、TDMAなど他方式への適用も考慮し、話を簡単に進めるために、MSと複数BSとの各回線間は、周波数または時間分割によりシステム運用に支障のない程度に干渉が抑えられ、十分信号が分離されるものと仮定する。

【００６３】回線設定方法を以下に示す。

【００６４】(1) MSは複数のパイロット信号をモニタし、Ec/Ioにより接続すべき優先順位を設定する。

【００６５】(2) MSは接続したいBS1に対してアクセスチャネルにより接続を試行する。

【００６６】(3) 接続が完了すると、MSは接続したBS101を経由してデータ受信要求とともにBSC106に接続可能なパイロット信号とそのEc/Ioを報告する。MS105は併せて、サポート可能な周波数，符号チャネル，送受信可能な伝送速度，およびサポート可能な回線の種別(例：制御回線の種別)などの情報を通知する。パイロット信号のIDによりBSC106はBSを識別する。BS102,103がさらに接続可能と仮定する。

【００６７】(4) BSCはパイロット信号のIDからBS102,103が接続可能なことを知り、 BS102,103の無線リソースがMS105に割り当て可能かを確認する。

【００６８】(5) もし可能であれば、BS102,103のID(パイロット信号)と割り当てられる回線(周波数，符号，タイミング)、伝送速度 をMS105に、現在接続しているBS101経由で通知する。不可能な場合は待ち状態に入り、(3)-(4)のプロセスを繰り返す。場合によりタイムアウト。

【００６９】(6) MS105はBS102,103について指定された回線の受信をセットアップする。

【００７０】(7) MS105はBS101,102,103の指定された回線で受信を開始する。

【００７１】(8) BSC106は伝送速度に応じて誤り訂正符号化やインタリーブのパラメータを選択し、符号化を行い、BSごとに信号を分配し、送信を開始する。

【００７２】(9) MS105は随時受信品質を監視する。監視パラメータはBS101,102,103の各々のEb/No， FER、および多重後のFERである。これらの値は予め定められた時間間隔で、専用の制御チャネルを用いてBSCへリポートされる。またEc/Ioをモニタしており、新たな接続可能なBSが出現した場合もBSCへリポートする。

【００７３】(10) BSC106は(9)をモニタしながら伝送速度を調整する。回線品質はEb/NoまたはFERによりリポートされる。特定BSのチャネル品質が劣化した場合は伝送速度を下げる。逆に改善した場合は伝送速度を上げる。多重後のFER品質の優先順位を最も高くする。

【００７４】(11) 特定の回線が、伝送速度を下限まで下げても規定された品質を維持できない場合、その回線を断とし、残りの回線で通信を継続する。

【００７５】(12) ハンドオフは行わない。回線接続・断のみである。

【００７６】３．２　リバースリンクについて

以下に回線設定方法を示す。

【００７７】(1) MSは複数のパイロット信号をモニタし、Ec/Ioにより接続すべき優先順位を設定する。

【００７８】(2) MSは接続したいBS101に対してアクセスチャネルにより接続を試行する。

【００７９】(3) 接続が完了すると、MS105は接続したBS101を経由してデータ送信要求とともにBSC106にEc/Ioのパイロット信号とそのEc/Ioをリポートする。パイロットによりBSC106はBSを識別する。

【００８０】(4) BSC106はパイロット信号のIDからBS102,103の接続を準備する。BS102,103の無線リソースがMS105に割り当て可能かを確認する。

【００８１】(5) もし可能であれば、BS102,103のID(パイロット信号)と割り当てられる回線(周波数，符号，送信タイミング)、伝送速度 をMS105に、現在接続しているBS101を経由して通知する。不可能な場合は待ち状態に入り、(3)-(4)のプロセスを繰り返す。場合によりタイムアウト。

【００８２】(6) MS105はBS102,103の指定された回線での送信をセットアップする。

【００８３】(7) MS105はBS101,102,103の指定された回線での送信を開始する。

【００８４】(8) MS105は指定された伝送速度に応じて誤り訂正符号化やインタリーブのパラメータを選択し、符号化を行い、BSごとに信号を分配し、送信を開始する。

【００８５】(9) BSC106は随時受信品質を監視する。監視パラメータはBS101,102,103の各々で受信された信号のEb/No，　FER、およびBSC多重後のFERである。これらの値は予め定められた時間間隔で、専用の制御チャネルを用いてMS105にリポートされる。またMS105はEc/Ioをモニタしており、新たな接続可能なBSが出現した場合はBSC106にリポートする。

【００８６】(10) MS105は(9)をモニタしながら伝送速度を調整する。回線品質はEb/NoまたはFERによりリポートされる。特定BSとの回線品質が劣化した場合は伝送速度を下げる。逆に改善した場合は伝送速度を上げる。多重後のFER品質の優先順位を最も高くする。

【００８７】(11) 特定の回線が、伝送速度を下限まで下げても規定された品質を維持できない場合、その回線を断とし、残りの回線で通信を継続する。

【００８８】(12) ハンドオフは行わない。回線接続・断のみである。

【００８９】４．伝送速度の設定方法

回線単位の伝送速度は所望の信号と干渉雑音電力比によって設定が可能であり、その対応の一例を図８(a)に示す。この対応テーブルは下り伝送速度制御回路(407または724)の記憶回路に格納されている。基準となる伝送速度はこれで決定され、回線品質の変動に対応して伝送速度も変化させる。また、実際の回線品質はFERで評価されることが多いので、図８(a)にはそれも付記した。回線品質パラメータ(例：FER，Ec/Io，Eb/No)の選定は、回線設定時，通話時などにより切り替えてよい。

【００９０】多重化後の伝送速度は使用可能な回線の伝送速度の総和で与えられる。ただし、このとき、この使用可能な回線間での干渉を考慮する必要がある。すなわち、同じ周波数やタイムスロットを用いる場合は、回線間で互いに干渉を生じるために、Ec/Io測定時に推測できたEb/Noと異なる干渉が測定され、FERの劣化により回線品質が満足できない事がありうる。このため、図８(b)には干渉余裕なるマージンを用意している。同じ周波数あるいはタイムスロットを利用するチャネル間ではこの逓減係数を用いて干渉余裕を与える。この対応テーブルは下り伝送速度制御回路(407または724)の記憶回路に格納されている。

【００９１】インタリーブ回路412または728による回線間におけるインタリーブは、情報を回線に分離後も、フェージングなどによるバースト誤りの劣化を十分抑圧するようにそのインタリーブサイズを設定する必要がある。したがって、分離する回線数と回線間の伝送速度比に応じてこのサイズは調整される。図８(c)にそのテーブル例を示す。また符号化利得により回線品質をあげるために、符号化方式のパラメータ(例：拘束長，符号化率)が調節されてもよい。インタリーブおよび符号化方式のパラメータは無線リソース管理部(407または732)の記憶回路に格納されている。

【００９２】５．送信するデータの分配方法

フレーム長に分割された入力データ631Aは、フレームを識別するID，属性，品質指標(QI)およびFECのためのTail Bitが付加される(630A)。このフレームはFECにより冗長性を付加された後、インターリーブされた系列628Aになる。前述の決定された伝送速度に従い、系列628Aは複数の系列に分割される。各情報系列には系列の順序，アドレスを与えるID，データ種別情報を与える属性，CRCなどの品質指標が付与され、626Aのサブフレームになり、BSCからBSに伝送される。627Aの情報系列をBSに分配する分配先の決定は、回線品質を確認する周期を最小単位として実行され、図８に示す伝送速度とBSとMSの各回線品質が対応するように制御される。

【００９３】回線品質の変動に伴いある回線は伝送速度が低下した場合には、バッファ回路411にてデータが送信待ち状態になることがある。この場合、他の回線が、その許容伝送速度に対し、伝送速度に余裕がある場合には、データを送信待ち状態とせずに、他回線へ切り替える。

【００９４】図９にMSと3つのBSの間で回線が設定されている場合の伝送速度および信号の配分例を示す。同図では、一回線あたりの最高伝送速度の時に、回線品質を評価する時間インターバル(tnとtn+1の時間間隔)あたり、インタリーブしたデータブロックに関し、4個のデータブロックを送信できるものとする。最低伝送速度では時間インターバル当り1個のデータブロックを送信するものとしている。この伝送速度はEc/Io, Eb/No, FERなどの図８に示す回線品質評価パラメータにより決定される。CH1に着目すると、CH1は時刻t1～t5の間、いずれも回線品質が最高レベルにあるため伝送速度も最大となる。一方CH2には、時刻t1～t5間で、時間に比例して通信品質が劣化しているため、伝送速度もそれに比例して劣化する。さらに、CH3は、時刻t1～t2間では、回線品質が最低であるため、１データブロックしか送れない。しかし時刻t3では、回線品質が向上したため、3データスロットを送ることが可能となっている。

【００９５】インタリーブ後の送信データの配分は、回線品質の良いものを優先して分配し、先に伝送する。これは、回線品質データ(Eb/No, Ec/Io, FER)受信後にできるだけ早く、伝播環境に応じた条件で、できるだけ多くの信号を伝送するためである。

【００９６】（実施例３）MS105が発呼し、複数の回線を設定する場合の動作例を図１０を用いて説明する。MS発呼要求を判定すると(1000)，MS105は発呼要求を送信する(1001)。この場合、発呼要求を伝送するチャネルを用いる。以降これをアクセスチャネルと呼ぶ。MS105はアクセスチャネルを用い、登録がなされているBSに対して発呼要求を行う。ただし、このアクセスチャネルが複数のBSにおいて受信可能であり、他のトラヒックチャネルと同様にBSC106において複数のBSからのアクセスチャネル受信信号の合成が可能で有れば、これを用いてもよい。

【００９７】MS105とBS101間でトラヒックチャネルが設定され、通信サービスが開始されたと仮定する(1002-1011)。MS105にBS101との回線だけでは容量が不足するアップロードする情報がある場合を仮定する。MS105はBSに対して、マルチBS伝送による高速伝送サービスを要求する(1040)。このとき、MS105は、BSC106に対し、MS105が受信しているある閾値以上のレベルのBSのパイロット信号とその強度(例:Ec/Io)統計値のリストを送信する(1022)。BSC106は受信したリスト情報をもとに、MS105と通信できる可能性のあるBSを探し、無線リソースの割り当てが可能か調査する(1023)。ここでBS102がBSC106により通信可能と判断されるとBSC106はBS102に対してMS105へ回線の起動要求をかける(1024-1025)。このときBSC106はBS101を経由してハンドオーバー起動要求により、MS105にBS102との回線設定を許可する(1026-1027)。MS105とBS102は、すなわち従来のハンドオーバーと同様の方法で新たに回線を設定し、MS105はBS101とBS102を経由して通信が可能になる(1028-1030)。MS105とBS101およびBS102の間で通信が開始されると、MS105は送信する情報を誤り訂正符号化しインタリーブしたのち、おのおのの回線品質に適応した速度に分配し送信するとともに、BSC106はBS101,102で受信された信号を多重化し、デインタリーブのの復号し信号系列を再生する(1031-1032)。BS数が3つ以上の場合も上記と同様であるが、ハンドオーバーメッセージが2つ以上になるところが異なる。

【００９８】上記において、先に接続しているBSが接続を断にする場合はMSとBS間の受信信号電力および回線品質に依存するがこれは後述する。BS/BSC側が発呼しMSで終端し、複数の回線を設定する場合の例を図１１を用いて説明する。

【００９９】BSC106はMS105のページング要求をネットワークから受信すると(1100)，MS105が登録されているBSからページングメッセージ (Page Message) を送信する(1101)。このとき、複数のBSからのページングメッセージをMSが受信し合成し復調可能であれば、その方法を用いてもよい。MSとそれが登録されているBS101との通信手順は従来の方法と同じである(1102-1112)。通信サービスが開始され(1113)，BSC側からマルチBSを用いた高速データサービスの要求があると(1130)，BSC106はBS101を経由して要求メッセージを送信する(1114)。このとき、BSC106はあらかじめこのMS105の信号を複数のBSにモニタさせ、接続の候補となりうるBSを前期のメッセージとともに送信してもよい。MS105は前述のメッセージに対し、ある一定の閾値以上の信号電力のパイロット信号およびそのリストをBS1経由でBSCに送信する(1115)。BSC106はMS105のリスト情報をもとに、候補となるBSを決定し、無線リソースの割り当てを行う。BS102の無線チャネルを割り当てるものとする(1116-1118)。BS101はBS102へのハンドオーバー起動メッセージをMS105に送信する(1119)。MS105はBS101との回線を保持したままでBS102との回線を設定開始する(1120)。MS105は従来のハンドオーバーと同じ方法でBS102との回線を設定する(1121-1123)。

【０１００】MS105がBS101,102と同時に回線を設定した状態になると、BSC106は送信すべき情報を誤り訂正符号化しインタリーブののち、回線品質に対応した伝送速度でBS101,102のおのおのに分配する。BS101,102はそれぞれ独立して設定される符号化およびセル(セクタ)信号設定により送信される。MS105ではBS101,102からの信号をおのおの独立した受信信号系列として復調した後、多重

化しデインタリーブののち復号し情報系列を再生する(1124-1125)。BS数が3つ以上の場合も前述と同様であるが、ハンドオーバーメッセージが2つ以上になるところが異なる。

【０１０１】（実施例４）ハンドオーバーの方法の概要を図１２を用いて説明する。引き続き詳細なシーケンス例を図１３を用いて説明する。図１２において、BS101-104は各々のサービスエリアをもち、前述のように、各々のサービスエリアは部分的にオーバーラップされている。BS101のエリアにいるMS105がBS104のエリアに移動する場合を考える。図１２(a)において、MS105はBS101だけからサービスを得られる領域にいるため、他のBS102～104とは回線を接続していない。図１２(b)において、MS105はBS101とBS103のエリアの境界に移動している。MS105は両方のBSと回線を設定し、各々の回線のEb/Noに対応する伝送速度で異なる情報を送受信している。図１２(c)では、MS105はBS101,103,104 のセル領域にあり、これら3つのBSと回線を設定している。ただしBS102のセル範囲外にある。MS105はBS103ともっとも良好なEb/Noを得ることができ高い伝送速度で通信している。BS101との回線は回線品質が悪いため低速になっている。図１２(d)はBS101-104のすべてのBSと接続可能な領域にMS105が移動した例である。この場合も4つの回線は異なる情報系列を干渉条件に応じた伝送速度で送信している。

【０１０２】次に図１３を用いてハンドオーバーの具体的な動作を説明する。MS105がBS101とBS102の両方と接続されていると仮定する(1300)。MS105は2つのBSと電力制御を行ないながら、干渉状態に応じて伝送速度を制御している。また、複数の回線のうち、少なくともひとつを高い優先順位に定めて送受信の優先権を与えるものとする。この順位はたとえば、回線の予約方法の優先権や、送信する信号の重要性などを規定するものである。ここでは、まず、BS101に高い優先順を与えて通信を継続すると仮定する(1301, 1302)。

【０１０３】ハンドオーバーでの接続中の回線の解放は、従来の周波数の異なるシステム間で回線の受け渡しを行なうハードハンドオーバーと同様の手順で行なわれる。ただし、制御信号の送受信が優先順の高い回線のみを用いて行われる。

【０１０４】BS101からの信号が高い優先順位にあるにも拘わらず、その信号強度が低くなり、閾値を下回った場合(1303)，他に優先順位の高い回線の条件があるものがあれば(1304)，そのうちの少なくとも一つ、ここではBS102に高い優先順を切り替える。MSはBSCに対してBS優先順位の変更を通知するとともに(1305)，新たなBSの候補リストを報告する(1306)。新たにBSを接続する場合の動作は図１０の動作とほぼ同一である。BS101からのEc/Ioは閾値よりも劣化すると、MS105はBS101に対し、伝送速度を下げるよう指示するとともに、MS105からの伝送速度も下げる(1309)。

【０１０５】BS101との回線の維持が困難な閾値以下にEc/Ioが劣化すると(1308)，MS105はBSC106に対し、新しいBSのリストを報告し(1309)，BS101の回線を解放することを通知し(1310)，BS101との通信を終了する(1312)。BSC106はBS101の無線リソースを解放する(1313)。この例では、BS2のみとの回線が維持されている(1314)。

【０１０６】

【発明の効果】本発明では、以下の効果がある。

【０１０７】(1) BS配置に伴う利用可能な無線資源を最大限に活用できる。すなわち、MSが、複数のBSから一定の干渉雑音電力閾値以下にある良好な電波環境にありながらも、ひとつの回線とすでに接続されていて、他のBSとの回線が利用できないMSに対し、他のBSとの回線品質に応じた伝送速度で通信することが可能になる。結果として、MSとBSC間において、伝送速度の向上が可能である。

【０１０８】(2) MSの移動に伴う回線の断と接続時には、ソフトハンドオーバーのように同じトラヒックを複数のBSと同時接続しない。しかし、FECとインタリーブした信号を回線間に分配しているために、一部の回線に情報の消失が生じても、符号化利得を用いてBS間の信号欠損を補償するために、MS-BS間の回線切り替え時にデータ欠損の少ない通信が可能になる。

【０１０９】(3) あるBSとMS間の回線が一時的に劣化したとしても、情報を分配する回線間で誤り訂正ならびにインタリーブが行われているために、ひとつの回線品質が劣化したとしても、他の回線と多重化後、符号化利得を用いて復調後の特性を改善できる。

【図面の簡単な説明】

【図１】本発明の通信システム構成を示す図である。

【図２】本発明の通信システム構成を示す図である。

【図３】本発明のフレーム構成を示す図である。

【図４】本発明の基地局制御局の構成例を示す図である。

【図５】本発明の基地局の構成例を示す図である。

【図６】本発明の端末の構成例を示す図である。

【図７】本発明の端末の構成例を示す図である。

【図８】本発明のパラメータ例を示す図である。

【図９】回線品質と回線伝送速度の関係例を示す図である。

【図１０】MS発呼時の回線設定シーケンス例を示す図である。

【図１１】MS終端時の回線設定シーケンス例を示す図である。

【図１２】端末移動時の通信例を示す図である。

【図１３】端末移動時の制御シーケンス例を示す図である。

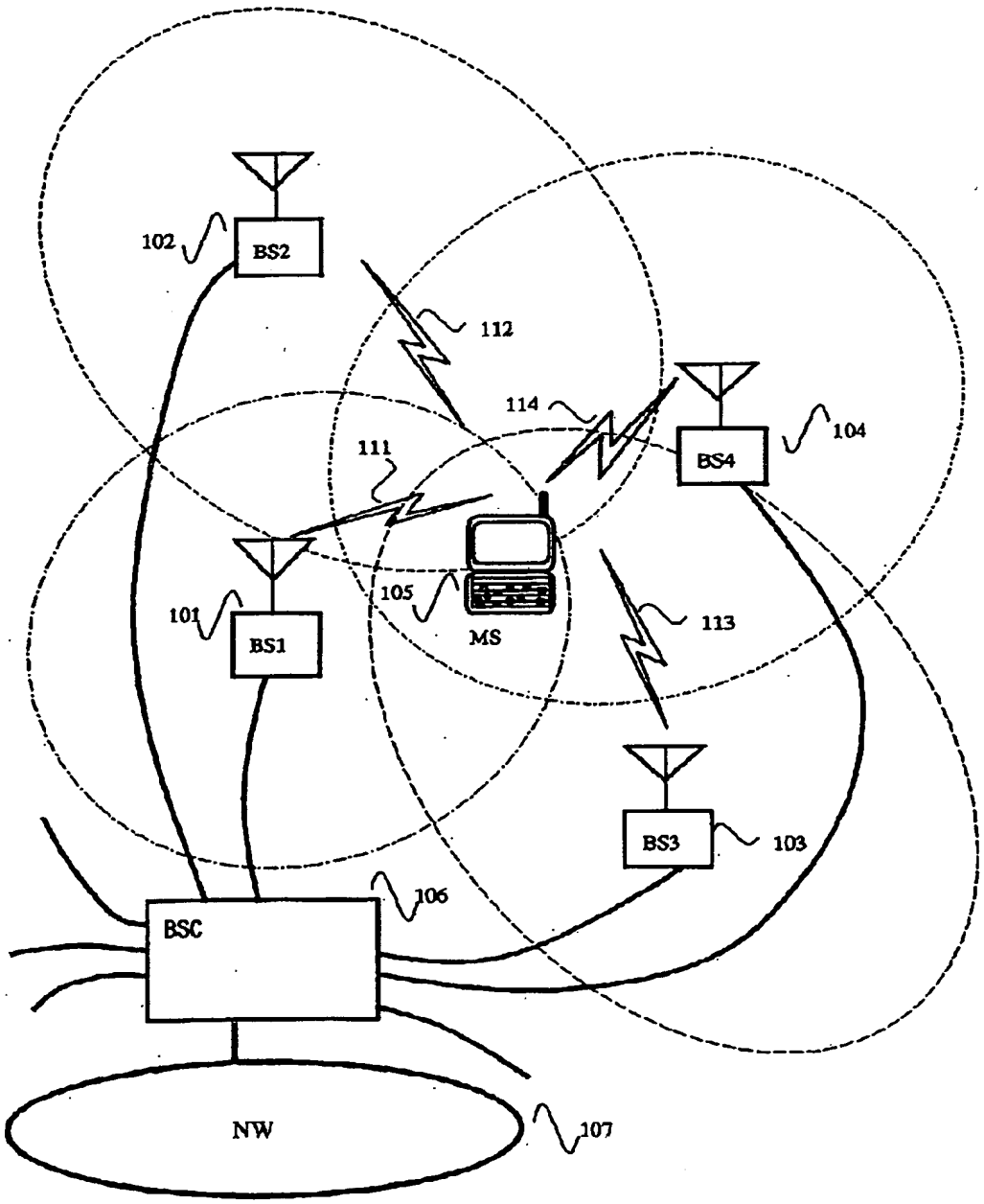
【符号の説明】

101-104…BS1-4(基地局1-4)、

105…MS(無線端末)、
106…BSC(基地局制御装置)、
107…ネットワーク、
301…データ収集部(Data Concentration)、
302…バッファ/多重部、
303…復号部、
304…伝送速度制御部、
305…無線リソース管理部、
306…分配部、
307…バッファ/分離部、
308…符号化部。

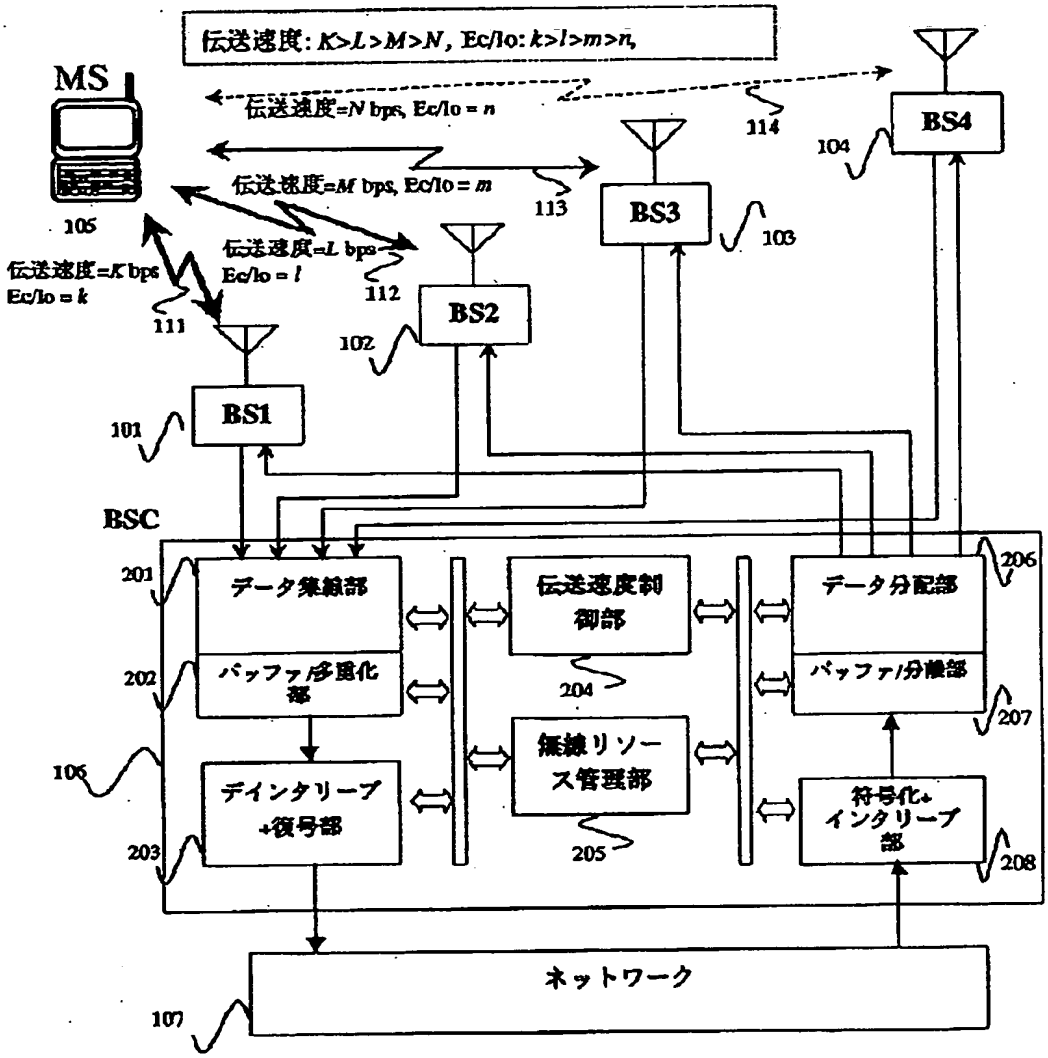
【図１】

図 1



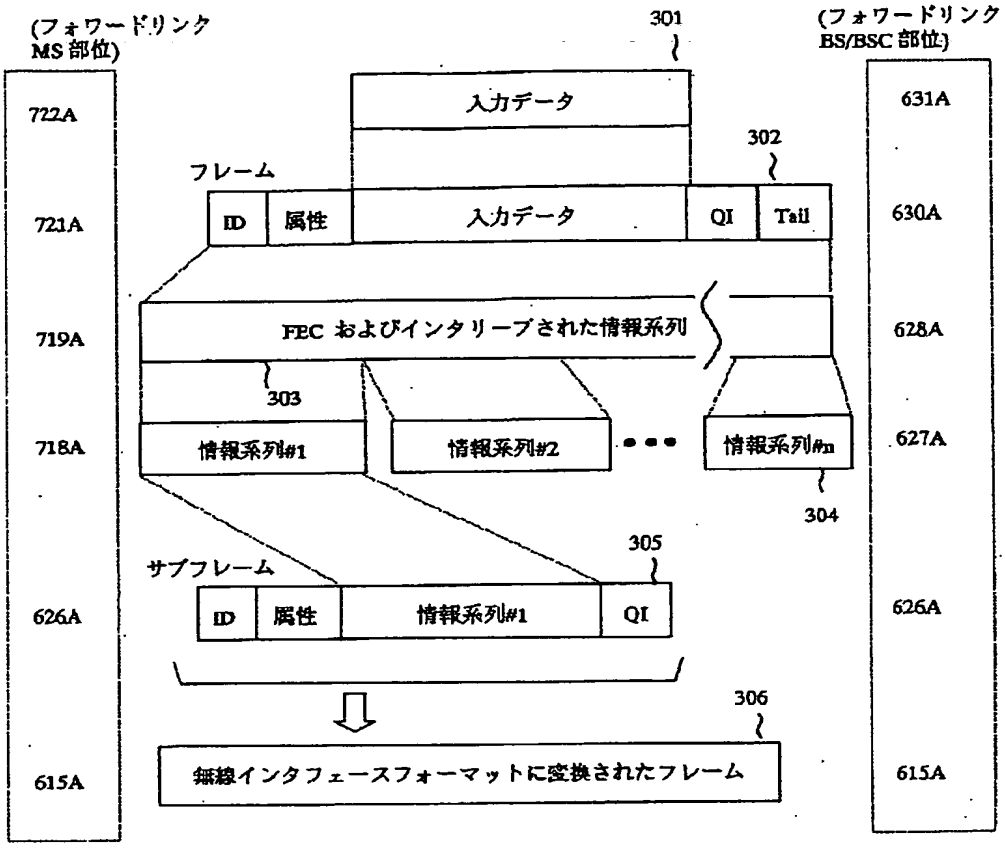
【図２】

図 2


伝送速度: K>L>M>N, Ec/Io: k>l>m>n,
MS
伝送速度=N bps, Ec/Io = n
114
BS4
104
伝送速度=M bps, Ec/Io = m
113
BS3
103
105
伝送速度=L bps
Ec/Io = l
112
伝送速度=K bps
Ec/Io = k
111
BS2
102
BS1
101
BSC
201
データ集線部
206
伝送速度制御部
データ分配部
202
バッファ/多重化部
204
バッファ/分離部
207
106
無線リソース管理部
符号化+インタリーブ部
203
デインタリーブ+復号部
205
208
ネットワーク
107

【図３】

図 3

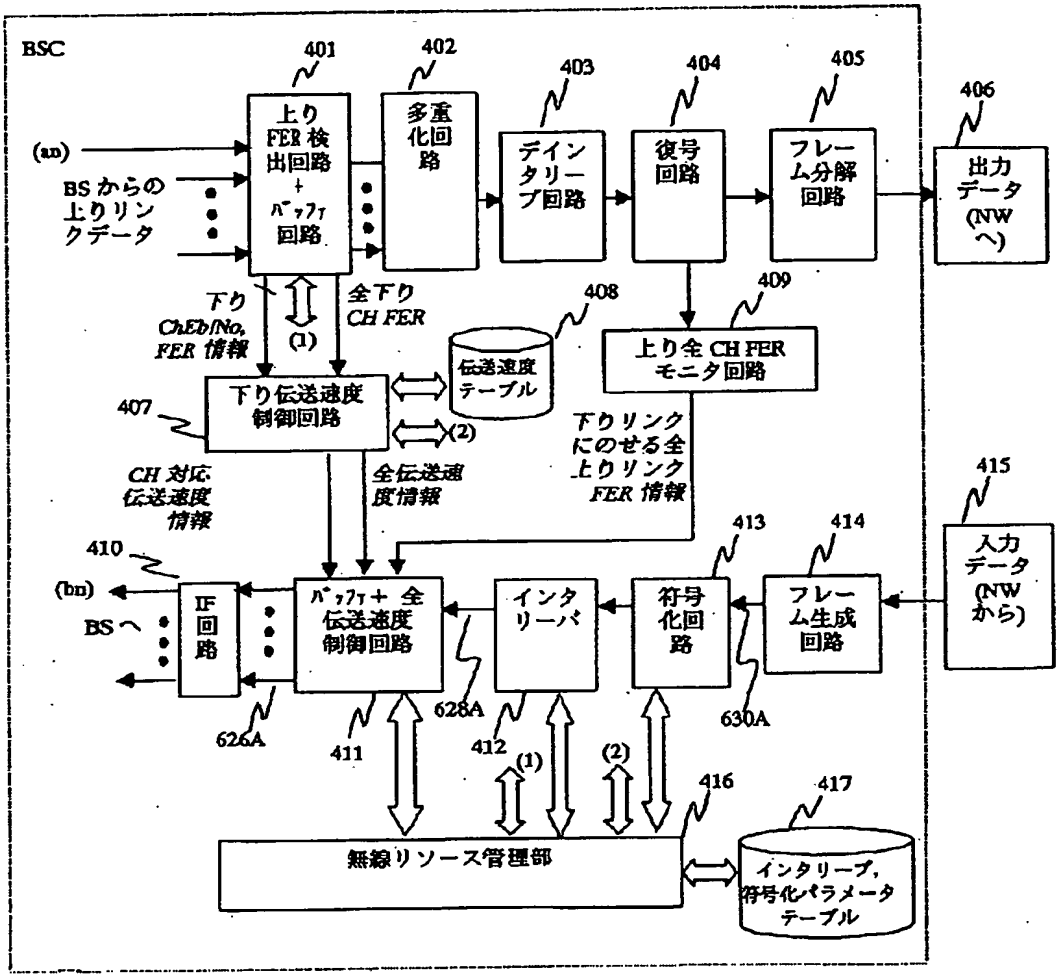



Note:

- QI＝品質指標( Quality Information)
- FEC=誤り訂正符号化(Forward Error Correction)
- Tail=FEC 用付加ビット
- ID=識別子(IDentifier)

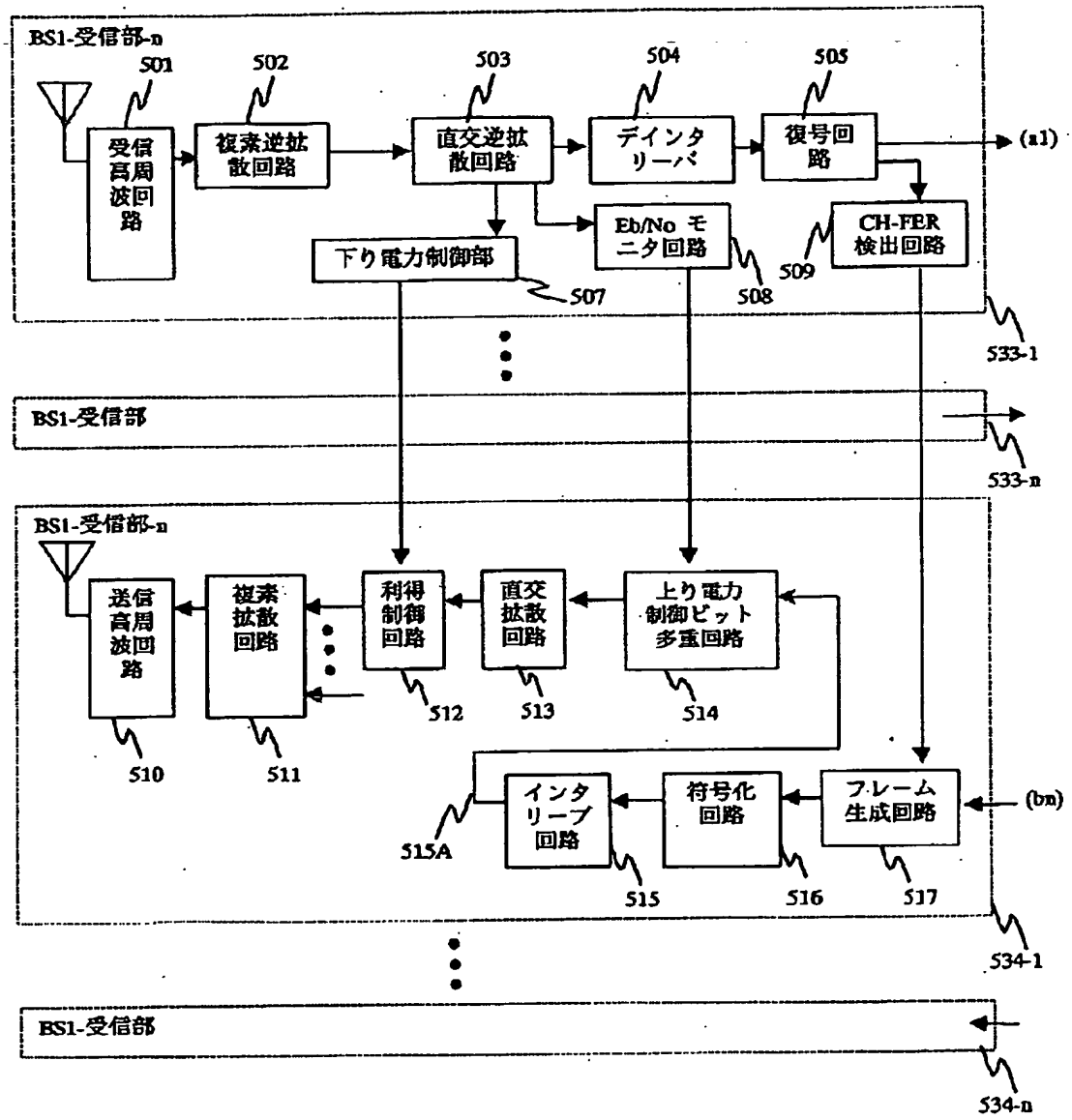
【図４】

図 4


BSC
401
402
403
404
405
406
上り FER 検出回路 + バッファ 回路
多重化回路
デインタリーブ回路
復号回路
フレーム分解回路
出力データ (NW へ)
(an)
BS からの上りリンクデータ
下り Ch Eb/No, FER 情報
(1)
全下り CH FER
408
409
伝送速度テーブル
上り全 CH FER モニタ回路
407
下り伝送速度制御回路
(2)
下りリンクにのせる全上りリンク FER 情報
CH 対応伝送速度情報
全伝送速度情報
415
410
413
414
(bn)
BS へ
IF 回路
バッファ + 全伝送速度制御回路
インタリーバ
符号化回路
フレーム生成回路
入力データ (NW から)
626A
628A
630A
411
412
(1)
(2)
416
417
無線リソース管理部
インタリーブ, 符号化パラメータテーブル

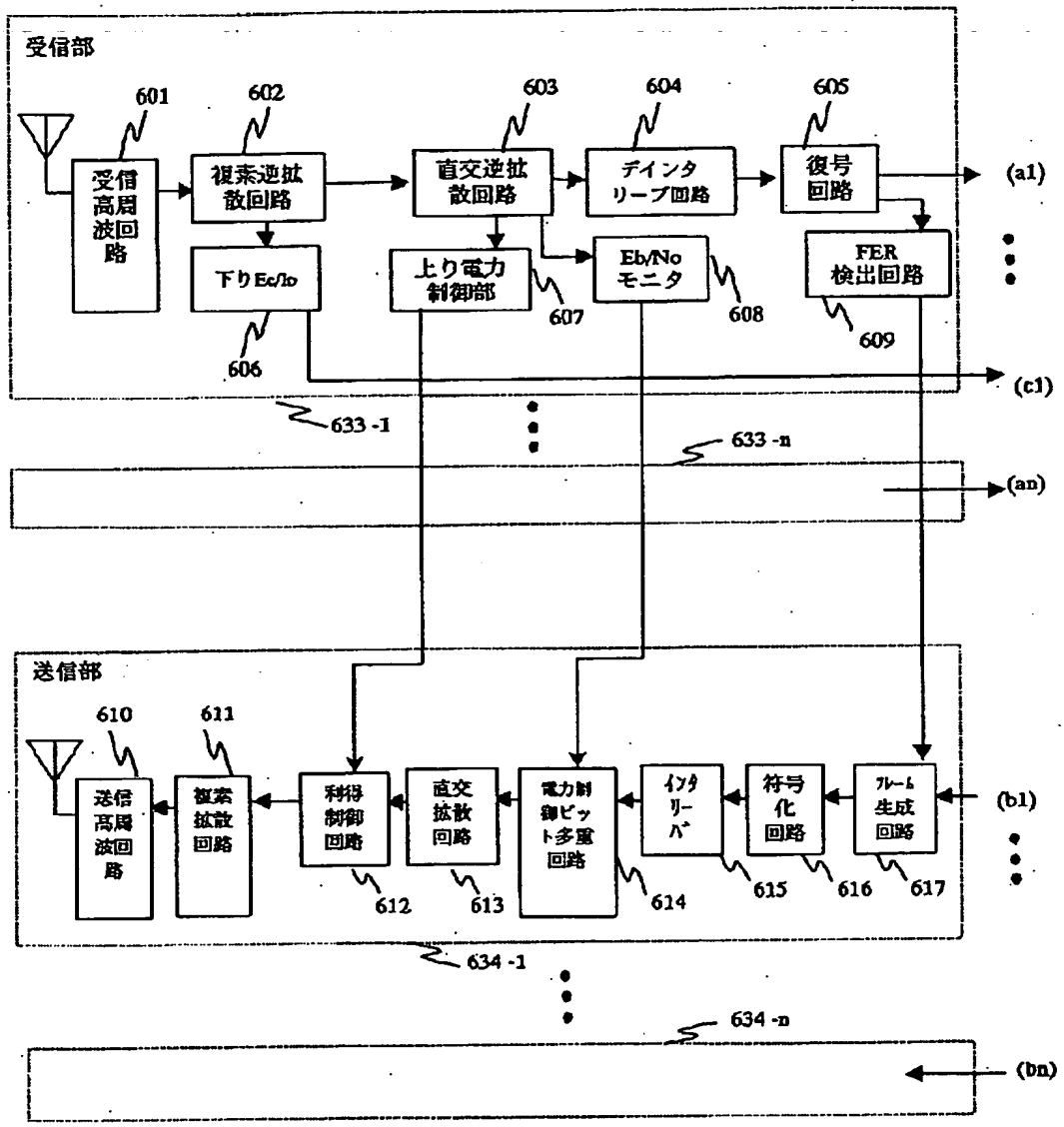
【図５】

図 5


BS1-受信部-n
501
502
503
504
505
受信高周波回路
複素逆拡散回路
直交逆拡散回路
デインタリーバ
復号回路
(a1)
Eb/No モニタ回路
CH-FER 検出回路
下り電力制御部
507
508
509
533-1
BS1-受信部
533-n
BS1-受信部-n
送信高周波回路
複素拡散回路
利得制御回路
直交拡散回路
上り電力制御ビット多重回路
510
511
512
513
514
インタリーブ回路
符号化回路
フレーム生成回路
(bn)
515A
515
516
517
534-1
BS1-受信部
534-n

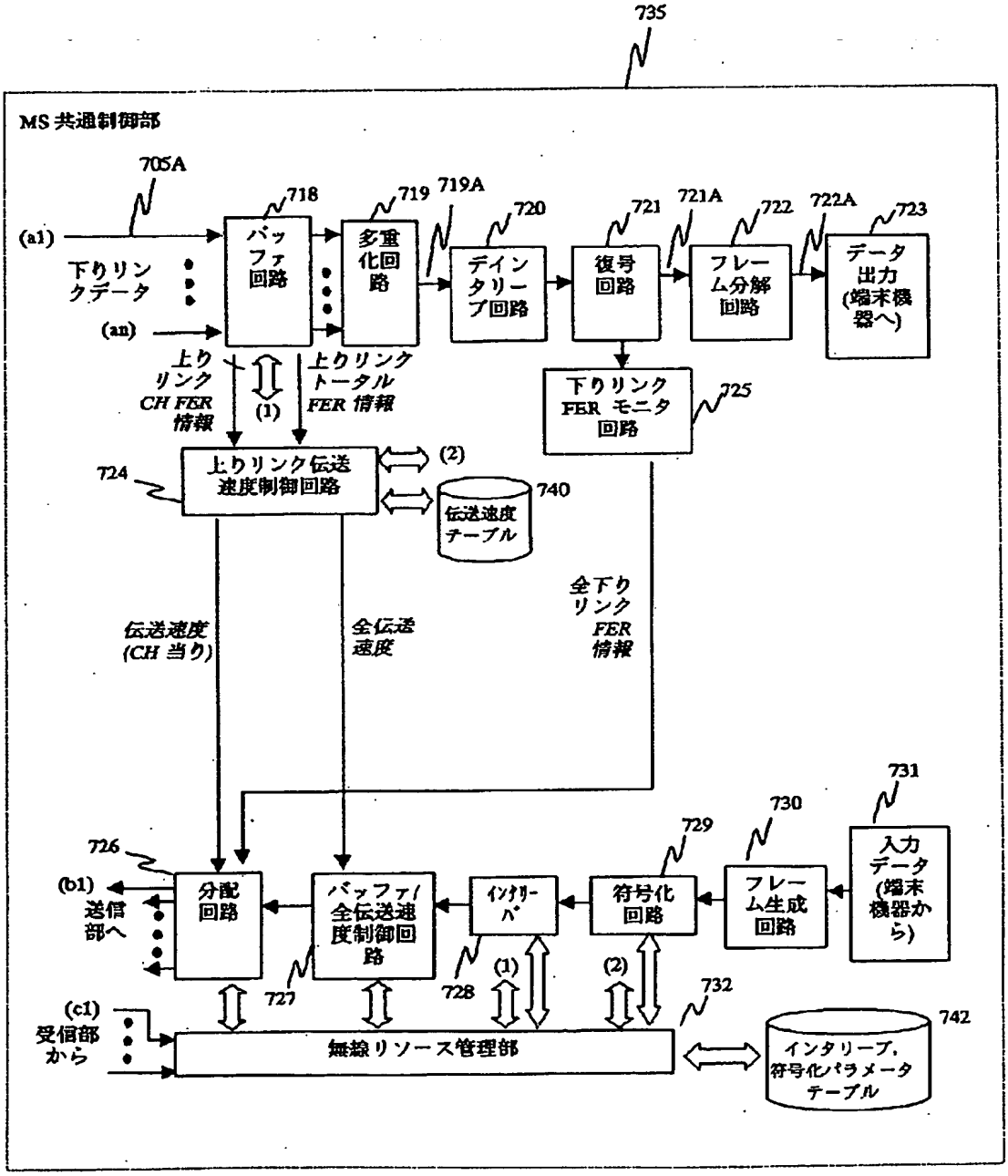
【図６】

図 6


受信部
601
602
603
604
605
受信高周波回路
複素逆拡散回路
直交逆拡散回路
デインタリーブ回路
復号回路
(a1)
下りEc/Io
上り電力制御部
Eb/Noモニタ
FER検出回路
607
608
609
606
(c1)
633-1
633-n
(an)
送信部
610
611
送信高周波回路
複素拡散回路
利得制御回路
直交拡散回路
電力制御ビット多重回路
インタリーバ
符号化回路
フレーム生成回路
(b1)
612
613
614
615
616
617
634-1
634-n
(bn)

【図７】

図 7


735
MS 共通制御部
705A
(a1)
下りリンクデータ
(an)
718
バッファ回路
719
多重化回路
719A
720
デインタリーブ回路
721
復号回路
721A
722
フレーム分解回路
722A
723
データ出力(端末機器へ)
上りリンクCH FER情報
(1)
上りリンクトータルFER情報
下りリンクFER モニタ回路
725
724
上りリンク伝送速度制御回路
(2)
740
伝送速度テーブル
伝送速度(CH 当り)
全伝送速度
全下りリンクFER情報
731
730
729
726
(b1)
送信部へ
分配回路
バッファ/全伝送速度制御回路
インタリーバ
符号化回路
フレーム生成回路
入力データ(端末機器から)
727
728
(1)
(2)
732
(c1)
受信部から
無線リソース管理部
742
インタリーブ,符号化パラメータテーブル

【図８】

図８

(a)回線単位の伝送速度パラメータ

| | | | | | |
|---|---|---|---|---|---|
| 最低Ec/Io | *s* | *t* | ---- | *v* | *w* |
| 最低Eb/No | *k* | *l* | ---- | *m* | *n* |
| CH当りの許容最大伝送速度 | *K* | *L* | ---- | *M* | *N* |
| 回線ごとのFER | 各回線の品質の評価に使用する。たとえばFERが基準値を下回る場合には伝送速度を下げる。 | | | | |

(b)多重化後の全伝送速度パラメータ

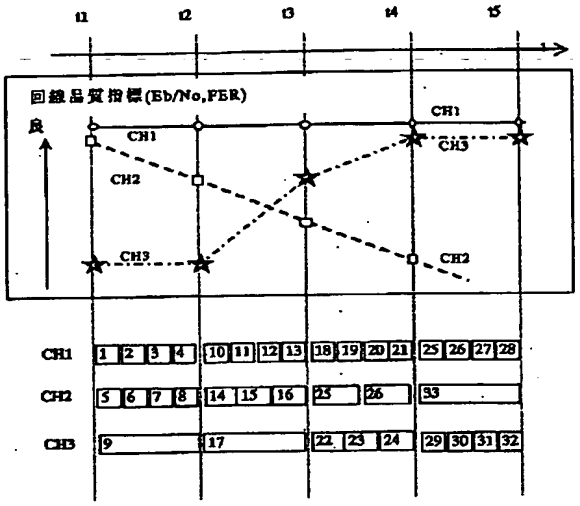
| | | | | | |
|---|---|---|---|---|---|
| 回線ごとの推定伝送速度総和 | *a* | *b* | | *c* | *d* |
| 干渉余裕係数 | 同一の周波数やタイムスロットを回線間で許容する場合に、特定の回線に適用する。回線予約方式やシステムの干渉余裕度に依存する。 | | | | |
| 許容最大伝送速度(多重化後) | *W* | *X* | ---- | *Y* | *Z* |
| 多重化後のFER | 各回線を多重化した後の品質の評価に使用する。たとえばFERが基準値を下回る場合には伝送速度を下げる。 | | | | |

(c)多重化信号のインタリーブサイズパラメータ

| | | | | | |
|---|---|---|---|---|---|
| 接続回線数 | *a* | *b* | | *c* | *d* |
| 回線間の伝送速度比 | *p* | *q* | | *r* | *s* |
| インタリーブサイズ(インタリーブするフレーム数) | *s* | *t* | ---- | *v* | *w* |

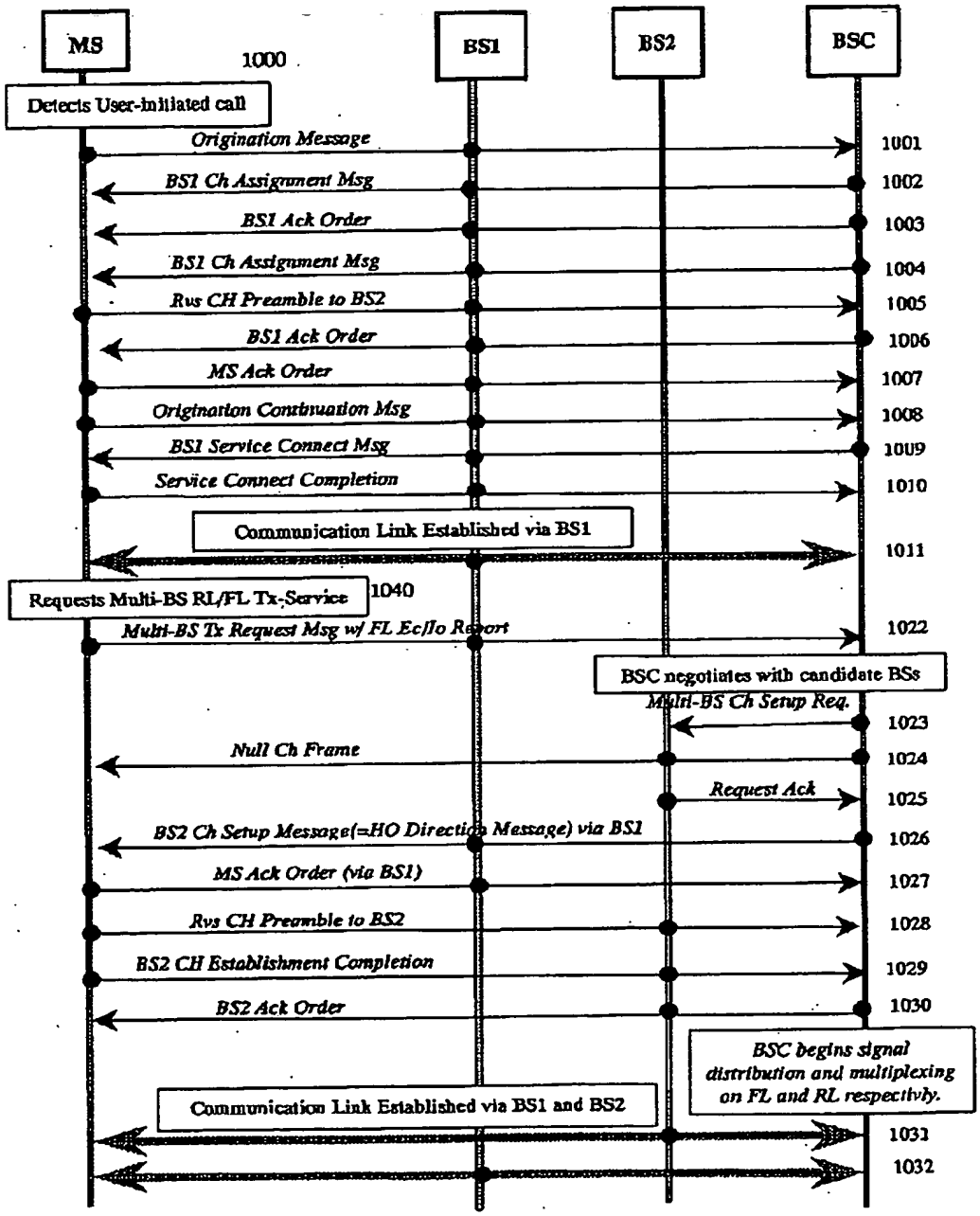
【図９】

図９


t1
t2
t3
t4
t5
t
回線品質指標(Eb/No,FER)
良
CH1
CH2
CH3
CH1
CH3
CH2
CH1 1 2 3 4 10 11 12 13 18 19 20 21 25 26 27 28
CH2 5 6 7 8 14 15 16 25 26 33
CH3 9 17 22 23 24 29 30 31 32

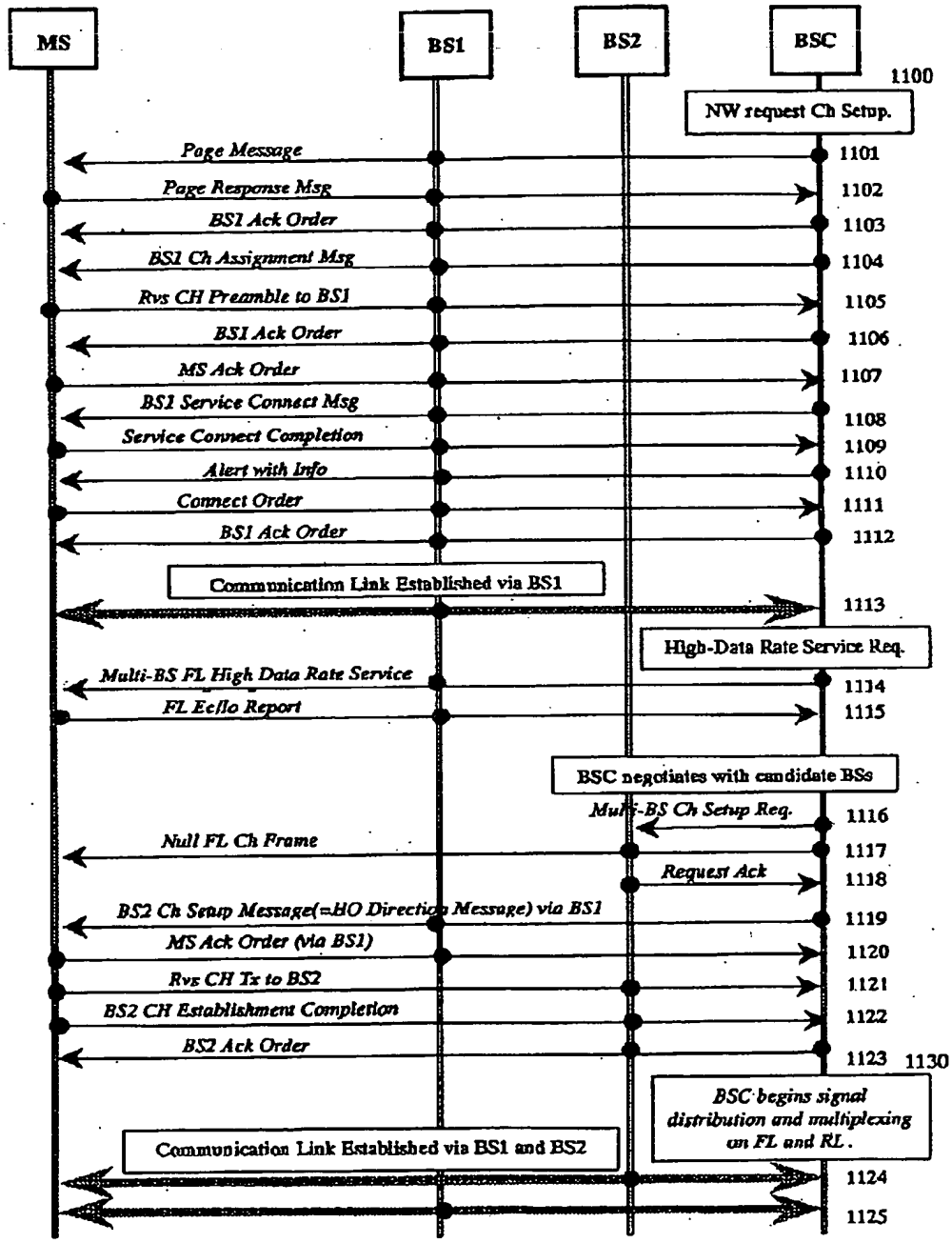
【図１０】

図 10


MS
BS1
BS2
BSC
1000
Detects User-initiated call
Origination Message
1001
BS1 Ch Assignment Msg
1002
BS1 Ack Order
1003
BS1 Ch Assignment Msg
1004
Rvs CH Preamble to BS2
1005
BS1 Ack Order
1006
MS Ack Order
1007
Origination Continuation Msg
1008
BS1 Service Connect Msg
1009
Service Connect Completion
1010
Communication Link Established via BS1
1011
Requests Multi-BS RL/FL Tx-Service
1040
Multi-BS Tx Request Msg w/ FL Ec/Io Report
1022
BSC negotiates with candidate BSs
Multi-BS Ch Setup Req.
1023
Null Ch Frame
1024
Request Ack
1025
BS2 Ch Setup Message(=HO Direction Message) via BS1
1026
MS Ack Order (via BS1)
1027
Rvs CH Preamble to BS2
1028
BS2 CH Establishment Completion
1029
BS2 Ack Order
1030
BSC begins signal distribution and multiplexing on FL and RL respectivly.
Communication Link Established via BS1 and BS2
1031
1032

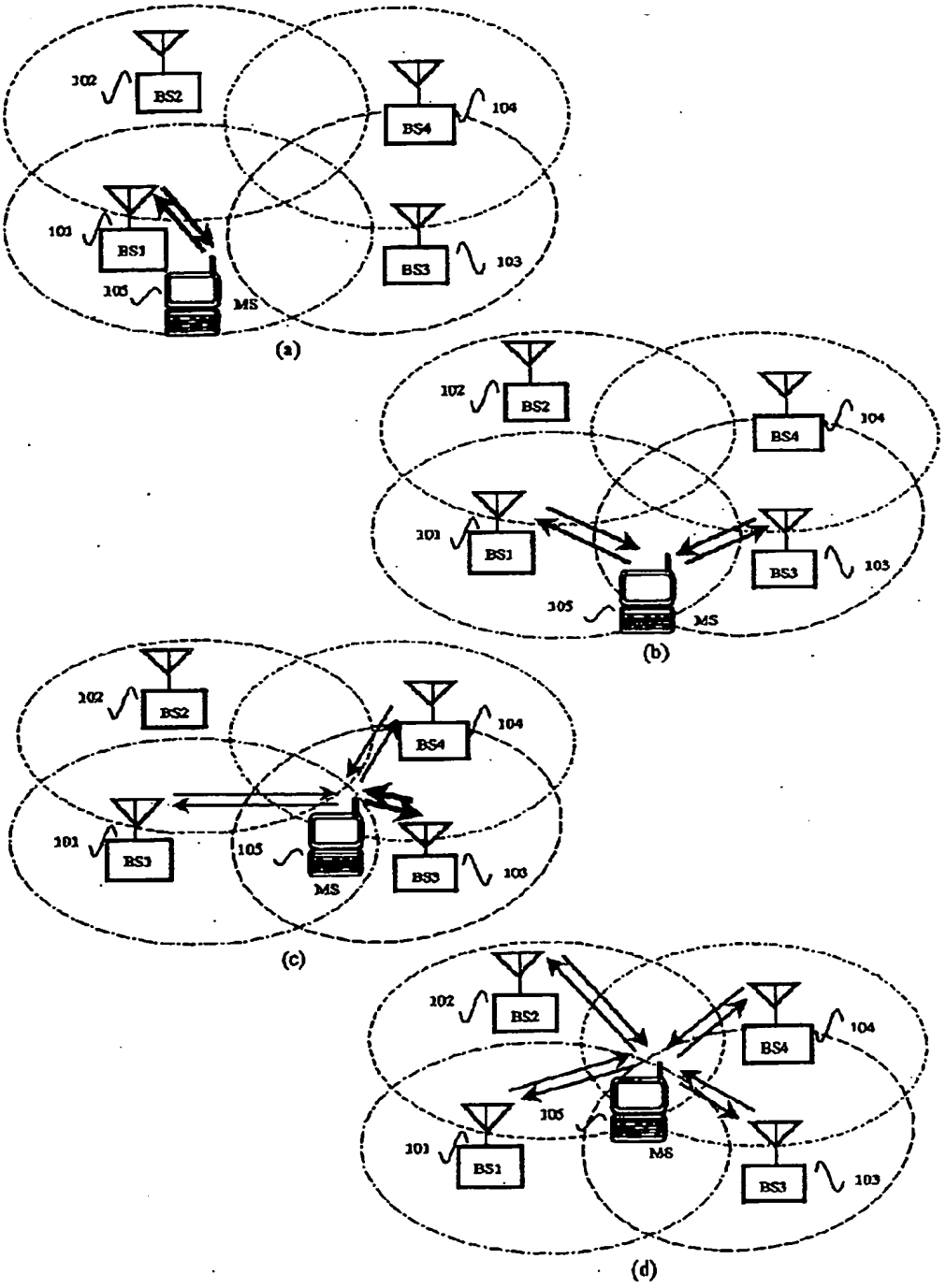
【図１１】

図 11


MS
BS1
BS2
BSC
1100
NW request Ch Setup.
Page Message
1101
Page Response Msg
1102
BS1 Ack Order
1103
BS1 Ch Assignment Msg
1104
Rvs CH Preamble to BS1
1105
BS1 Ack Order
1106
MS Ack Order
1107
BS1 Service Connect Msg
1108
Service Connect Completion
1109
Alert with Info
1110
Connect Order
1111
BS1 Ack Order
1112
Communication Link Established via BS1
1113
High-Data Rate Service Req.
Multi-BS FL High Data Rate Service
1114
FL Ec/Io Report
1115
BSC negotiates with candidate BSs
Multi-BS Ch Setup Req.
1116
Null FL Ch Frame
1117
Request Ack
1118
BS2 Ch Setup Message(=HO Direction Message) via BS1
1119
MS Ack Order (via BS1)
1120
Rvs CH Tx to BS2
1121
BS2 CH Establishment Completion
1122
BS2 Ack Order
1123
1130
BSC begins signal distribution and multiplexing on FL and RL.
Communication Link Established via BS1 and BS2
1124
1125

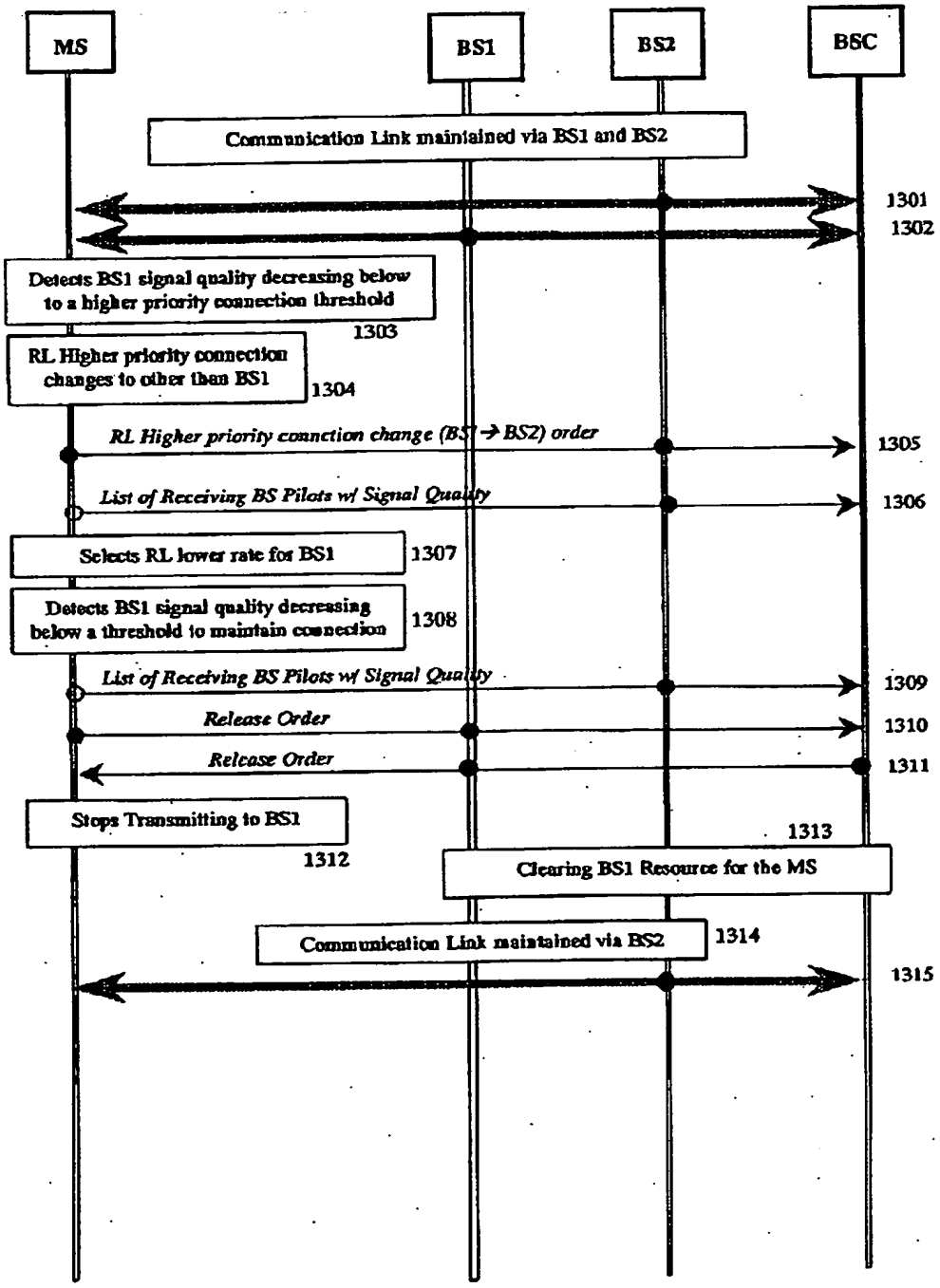
【図１２】

図 12



【図１３】

図 13


MS
BS1
BS2
BSC
Communication Link maintained via BS1 and BS2
1301
1302
Detects BS1 signal quality decreasing below to a higher priority connection threshold
1303
RL Higher priority connection changes to other than BS1
1304
RL Higher priority connction change (BS1→BS2) order
1305
List of Receiving BS Pilots w/ Signal Quality
1306
Selects RL lower rate for BS1
1307
Detects BS1 signal quality decreasing below a threshold to maintain connection
1308
List of Receiving BS Pilots w/ Signal Quality
1309
Release Order
1310
Release Order
1311
Stops Transmitting to BS1
1312
1313
Clearing BS1 Resource for the MS
Communication Link maintained via BS2
1314
1315

フロントページの続き

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Fターム(参考)　5K014 AA01 AA04 BA10 DA06 FA12
FA16 GA01 HA00 HA10
5K022 EE01 EE11 EE21 EE31
5K067 AA14 BB04 CC01 DD13 DD18
DD25 DD27 DD51 EE02 EE10
EE16 EE24 GG01 GG11 HH05
HH21 HH24 HH25 JJ12 JJ14